20.0 BATH STORAGE PILE

20.1 GENERAL DESCRIPTION OF BATH STORAGE PILE

The Bath Material Storage Pile (hereafter termed the Bath Storage Pile) was listed as SWMU 16 in the 1988 RFA Report by Versar (US EPA Contractor). The material that Versar listed as the Bath Storage Pile consisted of bath that had been dislodged from pot pads. KACC indicated that the bath material consisted of sodium, aluminum, calcium, and cryolite containing material (Versar, *RCRA*).

20.1.1 Location

The Bath Storage Pile that was observed during the 1987 Sampling Visit was located on the paved area outside and to the east of the Potliner Breakout and Accumulation Buildings as shown in Plate 2.

20.1.2 Construction and Modifications

When failed pots are removed from operation for reconstruction, some residual alumina, bath material, and solidified aluminum remains in the pot. In order to reconstruct the pot cells, the pot pad (the solidified non-siphoned aluminum present in the pot at the time of failure) and some associated bath are removed from the pot. In the past, pot pads were placed on the paved area outside of the Potliner Breakout and Accumulation Building while awaiting transportation to a secondary smelter. During handling of the pot pads, some of the associated bath material separated from the pot pads and remained on the paved area. Small, temporary piles of separated bath were created during this process. The number and location within the area varied depending upon the amount of bath adhering to the pot pads. The bath piles were periodically consolidated and transported off-site for disposal. One of these small residual piles of dislodged bath material was what was listed as SWMU 16 by Versar in the 1988 RFA Report. Since 1995, pot pads have been managed inside of Building 66.

20.1.3 Operations and Management

20.1.3.1 Past Operations

Prior to the construction of the Potliner Breakout and Accumulation Buildings in 1979 and when the pots were soaked to aid in the breakout process, the associated bath material was intermingled with the potliner and disposed of along with the potliner. When the Potliner Breakout and Accumulation Building was constructed in 1979, the soaking of the pots prior to breakout was discontinued. Therefore, in 1979, the staging of pot pads from broken out pots was initiated on a paved area outside of the Potliner Breakout and Accumulation Buildings while awaiting shipment off site for secondary smelting. Bath material which dislodged from pot pads during handling remained on the paved area until it was periodically cleaned up.

20.1.3.2 Current Status

The current handling of the pot pads takes place within Building 66. Thus, bath material associated with the pot pads is contained within Building 66. Bath dislodged from the pads is periodically swept up and managed appropriately.

20.1.4 Possible Hazardous Constituents

There are no significant concentrations of hazardous constituents in bath. Samples of raw material bath were analyzed for cyanide and fluoride in 1980. A distilled water extract of the bath contained 0.09 mg/L total cyanide, 0.002 mg/L free cyanide, and 0.278 mg/L fluoride.

20.1.5 Possible Migration Pathways

Since there are no known hazardous constituents associated with the bath material, there is no need for analyses of possible migration pathways.

20.2 INVESTIGATION OF SURROUNDING SOILS

During a 1987 Sampling Visit conducted by Versar for the RFA, one soil sample was collected from the east side of the Bath Storage Pile and analyzed for total metals and cyanide (Versar, *RCRA*). The sampling location is shown in Figure 4-3. No cyanide or other metals were detected significantly above background concentrations, as determined by a background soil sample collected near production well F-9 (see Appendix D-1 for analytical results). In the Draft RFA, Versar concluded that no hazardous constituents had been released from this unit and that no further enforcement actions were necessary.

20.3 ASSESSMENT OF FURTHER INVESTIGATION NEEDS

Currently, there is no visual evidence of possible impacts from the Bath Storage Pile. The concentrations of metals in the soil samples from around the Bath Storage Pile were not significantly higher than background levels and were much less than US EPA Region III risk-based screening levels for both industrial and residential soils (US EPA Region III, *Selecting*). Based on the fact that there are no known hazardous constituents associated with the Bath Material, the absence of visual evidence to suggest industrial and residential soils (US EPA Region III, *Selecting*). Based on the fact that there are no known hazardous constituents associated with the Bath Material, the absence of visual evidence to suggest environmental impacts from the Bath Storage Pile, the previous soil sampling results and corresponding Region III risk-based screening levels, and Versar's previous conclusions, no further assessment of the soils in the vicinity of the Bath Storage Pile is required, and this unit should be removed from any further consideration in the RFI process. Should a site-wide risk assessment become necessary, existing data can be used to represent constituent concentrations in this area.

20.4 SUMMARY OF BATH STORAGE PILE

The material that Versar listed as the Bath Storage Pile in their 1988 RFA Report consisted of bath that had been dislodged from pot pads that were being accumulated outside of the Potliner Breakout and Accumulation Buildings. KACC indicated that the bath material consisted of sodium, aluminum, calcium, and cryolite containing material.

When pot pads are removed from failed pots, the pot pads are placed on the paved area outside of the Potliner Breakout and Accumulation Building while awaiting disposal. During handling of the pads, some associated bath material may be dislodged and remain as a pile on the concrete pad. Bath material dislodged from pot pads is periodically collected and recycled, sold, or transported off site as a solid waste.

Since there are no known hazardous constituents associated with the bath material and analyses of the soil sample collected for the 1988 RFA detected no significant impacts from the Bath Storage Pile, no further investigation of the soils around the Bath Storage Pile is recommended, and this unit should be removed from further consideration in the RFI process.

21.0 COOLING TOWER SLUDGE BINS

In late 1986, KACC took the main fabrication cooling tower off-line for maintenance. The cooling tower has a stilling basin beneath it to collect and recirculate the water that is being cooled in the tower. The noncontact cooling water from throughout the fabrication plant, including the furnaces, contains periodic, incidental low concentrations of oil. Water is skimmed from the stilling basin daily to remove the oily sheen that develops. Over time, some sludge had accumulated in the bottom stilling basin. KACC removed the sludge and placed it in steel tubs, which measured approximately 5 feet by 4 feet by 5 feet. The tubs were staged just to the north of Tank 1 and the Emergency Spill Basin at the location shown on Plate 2. KACC requested DNR approval to place the sludge in the on-site primary sewage treatment drying beds for dewatering prior to final disposal. While KACC and the agency carried on negotiations with reference to appropriate disposal of this sludge, the sludge tubs were staged north of Tank 1 for a several months. The tubs were covered; but they were not water tight. The staging of these tubs at this location was a one-time operation, not a routine management practice.

The Cooling Tower Sludge Bins were still present at the site during the 1987 Versar (US EPA Contractor) RFA Sampling Visit, and Versar listed the Cooling Tower Sludge Basins as SWMU 17. The term bins is more appropriate than basins and is, therefore, used in this report to denote this unit. During the 1987 RFA Sampling Visit, Versar observed oil-stained soil associated with leakage from one of the tubs.

For the 1988 RFA Report, Versar collected a soil sample and analyzed the sample for TCL volatile and semivolatile organics, total metals, and oil and grease content (Versar, *RCRA*). The sampling location is shown in Figure 8-1. Methylene chloride, toluene, and oil and grease were detected in this sample (see Appendix D-1, D-2, and D-3 for analytical results). It should be noted that methylene chloride is a common laboratory contaminant and that it was detected in the blanks associated with this sampling event. The concentrations of methylene chloride and toluene reported for the 1988 RFA soil sample were below US EPA Region III risk-based screening levels for both industrial and residential soils (US EPA Region III, *Selecting*). No concentrations of metals or cyanide were detected above background levels, as determined by a soil sample collected near production well F-9, or above US EPA Region III risk-based screening levels. This soil sample indicated that no substantial soil impacts had resulted from the release of

ppB
30 ~~Face~~tone
50 Toluene

constituents from these bins, and currently there is no visual evidence to suggest impacts from the releases. The sludge from these Cooling Tower Sludge Bins was eventually shipped to an off-site solid waste landfill.

Based on the fact that the staging of the Cooling Tower Sludge Bins was a one-time operation, the absence of visual evidence to suggest impacts from the release, and the previous soil sample results and the corresponding US EPA Region III risk-based screening levels, no further soil sampling is proposed for the Cooling Tower Sludge Bins, and this unit should be removed from any further consideration in the RFI process. Should a site-wide risk assessemnt become necessary, existing data can be used to represent constituent concentrations in this area.

22.0 OTHER AREAS

In addition to the areas of the facility listed as SWMUs in the 1986 NUS (US EPA Contractor) Interim RFA Report and the 1988 Versar (US EPA Contractor) RFA Report, there are three other areas that warrant discussion in this DCC Report.

22.1 OLD LANDFILL

Prior to 1960, wastes generated by KACC at the facility were placed in the Old Landfill. The Old Landfill was located north of and across the railroad tracks from the closed Industrial Landfill as shown on Plate 2. Aerial photographs from the 1950s indicate that the old landfill may have been used as a refuse dump prior to KACC acquiring the property. There is no record as to what was placed in this dump. However, because the old landfill was in use during construction of the facility (significant construction occurred between 1955 and 1960 - refer to Table 2-1), it can be surmised that construction debris is a substantial portion of the contents of the old landfill. Section 2.5 of this report discusses routine waste generation at the Ravenswood facility. Process waste generation from 1957 to 1960 was essentially the same as that described for later years. Wastes listed in Table 2-2 as being previously disposed in the on-site landfill most likely were disposed of in the old landfill as well as the Industrial Landfill (see Section 17). Wastes listed in Tables 17-3 and 17-4 were also most likely disposed of in the old landfill. The landfill was probably unlined and has been covered with soil. No drawings or documentation of this unit's construction are available. Based on the speculative nature of the information available about the materials placed in this unit and the likely variability of materials from one location to another, no soil sampling in the Old Landfill is recommended. Instead, groundwater sampling is recommended to assess if any hazardous materials are leaching into the groundwater. The proposed sampling of the groundwater underlying the Old Landfill is discussed in Section 23.6 of this report.

22.2 RAILCAR LOADOUT BUILDING

From September 1991 to early 1992, spent potliner was transported from the Potliner Breakout and Accumulation Building to the Railcar Loadout Building for rail shipment to an appropriate landfill. This building was not used again until 1994 when 700 tons of spent potliner was shipped by rail to the Reynolds Aluminum thermal treatment facility at Gum Springs, Arkansas, for a certification test. This building is located just east of the Tank Farm, is a metal sided building on a concrete slab, straddles a railroad spur, and has one roll-up door on either end over the railroad tracks. Spent potliner was moved from Building 66 to this building in covered tubs for railcar loading.

This building has been used solely for the loading of potliner into railcars; therefore, the only possible hazardous constituent associated with the Railcar Loadout Building is cyanide from the spent potliner. Since the potliner was not stored at this facility, the only possible migration pathway for constituents from this building was release of dust generated during loading operations. The standard operating procedure is to close the doors of the building during loading operations. Therefore, migration of dust during loading operations does not generally occur. However, one soil sample is proposed for the Railcar Loadout Building. The sample is proposed for a location that would receive fugitive dust in the event that standard procedures were not followed. The proposed sampling is described in detail in Section 3 of the approved RFI Workplan.

22.3 OUTFALL 001 CONVEYANCE

Outfall 001 is located at the Interceptor Basin 001 just north of the closed Industrial Landfill, shown in Plate 2. The Outfall 001 Conveyance is a ditch constructed by KACC around 1957 to convey discharged water to the Ohio River. It runs west to the river from the exit of an aluminum culvert at the northwest corner of the toe of the Industrial Landfill, along the north edge of the Sprayfield.

Outfall 001 serves the Fabrication Plant. Industrial processes discharging to this outfall include contact and noncontact cooling water. Table 22-1 summarizes the constituents detected in the effluent. Stormwater that discharges through Outfall 001 originates from the roof of the southern end of the Fabrication Plant and from parking lots and roadways immediately east and south of the Fabrication Plant. The stormwater permit application for Outfall 001 includes the results of sampling a qualifying rainfall event. The results of this sampling are summarized in Table 22-2. Both industrial water and stormwater flow to the 001 Interceptor Basin. The 001 Interceptor Basin was installed in the mid 1970s. The 20,000 gallon basin is constructed of concrete and has oil skimming equipment.

Past discharges to the Outfall 001 Conveyance included non-contact cooling water, horizontal heat treat blowdown, surface and roof stormwater runoff, basement sump drainage, and non-process runoff. Prior to the construction of the Oil Recovery Ponds in 1971, the aqueous phase of waste coolant from the hotline rolling mills was discharged through the Outfall 001 Conveyance to the river. Originally, discharge water flowed in an open ditch from the railroad tracks at the current discharge location to the river. Around 1975, an aluminum culvert was installed in the previously open ditch from the railroad tracks 600 feet to the south and west. The locations of the culvert and former open ditch are shown on Plate 2. Most of this former ditch and culvert lie beneath landfill cover and capping materials. In 1976, the Interceptor Basin 001 was installed above the 100-year floodplain at the east end of the aluminum culvert, as shown on Plate 1. During the time that the aqueous phase of waste coolant was discharged through the Outfall 001 Conveyance, the waste coolant contained lead.

22.3.1 Oil and Grease Reduction

The current sources of water to Outfall 001 Conveyance include non-contact cooling water and stormwater runoff (RAC, *NPDES*, 1991). Historically, heavy rainfall events resulted in increased amounts of oil and grease in the Outfall 001 Conveyance discharge. Large ventilators located on the roof of the Fabrication Plant circulate air throughout the building. Exhaust air from the Fabrication Plant contains coolant/lubricant mist from the various milling machines. The oil mist condenses in the ventilators and on the roof in the vicinity of the ventilators. Heavy rainfall washes the condensed coolant/lubricant to Outfall 001 via the roof drains. Light rainfall events do not provide sufficient runoff to transport the oil and grease into the Outfall 001 Conveyance discharge.

The 1985 NPDES Permit required that KACC institute a study to determine measures to promote oil and grease removal and to evaluate the hydraulic loading of the Interceptor Basin 001. The study was performed with the resulting recommendation being to install precipitating louvers above the existing exhaust louver system for more efficient interception of the oil and grease content in the ventilated air form the Fabrication Plant. During 1989, the louver system was installed.

To further reduce rain day oil and grease discharges to Outfall 001 Conveyance, RAC contracted Roux Associates of Martinsburg, West Virginia, to conduct studies relative to oil and grease discharges to Outfall 001 Conveyance. Based on Roux's recommendations, RAC performed several activities directed at further reducing rain day oil and grease discharge to Outfall 001 Conveyance:

- In November 1993, the removal of oil and grease from condensed coolant vapors on the roof above the 5-stand hot mill was completed.
- The bulk storage container for the coolant mixture material was covered in 1994.

These two efforts reduced the oil and grease discharge from 200 to 250 mg/L in the mid 1980s to 15 to 30 mg/L in 1994. In August 1994, an additional weir was installed in the spillway of Interceptor Basin 001 above the previously existing weir. The capacity of the previously existing weir was exceeded during storm events, and stormwater flowed over the spillway. The addition of the weir in the spillway facilitated measurement of the flow that passes through the Interceptor Basin 001. Additionally in 1993 - 1994, the stormwater drainage from the hotline roof was diverted from the 001 conveyance into the Oil Recovery System.

To further reduce oil and grease discharges to Outfall 001 Conveyance in the future, RAC will identify and remedy, where possible, any further discovered sources of oil and grease to the Outfall 001 Conveyance. In addition, a series of grab samples taken over equal time increments during normal working hours of occurring storm events will be utilized to more accurately ascertain the levels of oil and grease being discharged to the Outfall 001 Conveyance, as opposed to the current practice of taking one grab sample during the peak storm flow.

22.3.2 DEP Compliance Inspection Results

On February 8 and 9, 1994, DEP conducted a Compliance Inspection to evaluate RAC's compliance status with their NPDES Permit. Three soil samples were collected in the Outfall 001 Conveyance and analyzed for PCB and semivolatile organic compounds. The laboratory results of these samples reported levels of the PCB aroclor 1260 ranging from 0.270 to 1.462 mg/kg, with the concentrations increasing with increasing distance from Interceptor Basin 001. Follow-up sampling performed by RAC resulted in concentrations ranging from 0.36 to 1 mg/kg. However, the laboratory reported that these results may be elevated due to collection of non-aroclor matrix components. Additionally, these levels are significantly below the TSCA clean-up level of 25 mg/kg in soil for restricted access areas.

22.3.3 Assessment of Further Investigation Needs

As stated in Section 2.5.5 of this report, PCBs were used at the facility in transformers and other electrical equipment before the manufacture and sale of PCBs were curtailed in 1977. The facility is currently phasing out existing PCB transformers. As stated in Section 2.7, about 16,000 gallons of water containing detectable levels of PCBs were inadvertently released to the 001 Outfall Conveyance in 1988. Additionally, the aqueous phase of waste coolant that was discharged through the 001 Outfall until 1971 may have contained lead. Sediment sampling was proposed for the conveyance. Monitoring wells may be installed and sampled, contingent upon the results of the analyses of sediment samples. The details of the recommended sediment sampling are presented in the Data Collection Quality Assurance Plan of the RFI Workplan. The former open ditch located between the 001 Interceptor Basin and the 001 Outfall

Conveyance conducted the same materials as the 001 Outfall Conveyance until construction of the culvert in 1975.

22.4 USED OIL SUMPS AND PIPING

22.4.1 Carbon Plant

There are two hydraulic presses in the Carbon Plant that compress a mixture of various raw materials into "green" anodes. Carbon plant processes, raw materials, and waste streams are discussed in Section 2.5.1. Small amounts of hydraulic oil drip from the two presses onto the concrete floor beneath the machines. Sumps of about 1 foot diameter and 3 foot depth are cast into the concrete floor beneath the two existing presses and one unused press site. One pump is located on the main floor of the plant with intake lines to each sump. When oil or oily water from wash-downs is found to be present in any of the sumps, the pump is started manually. The hydraulic oil is pumped through an underground pipe into two used oil tanks located north of the Carbon Plant. The underground pipe is constructed of 3-inch diameter carbon steel and is buried approximately 3 feet under the ground surface. The distance from the sumps to the used oil tanks is approximately 75 feet. The location of the underground pipe and used oil tanks is shown in Figure 2-2A.

The sumps are checked at least once per day for the presence of oil. The oil in the underground pipe drains back to the sump once pumping stops, so the pipes are not pressurized with oil except during the actual transfer of material. The two 500-gallon used oil tanks are mounted above a secondary containment structure, which was present when the tanks were installed. Used oil in the tanks is removed by vacuum truck. The used oil is generally sent to an off-site recycle facility. It may also be placed into the Oil Recovery System at the sump at Tank 1. Used oil can also be pumped from the sumps directly to tanker trucks.

The used oil tanks are horizontal tanks constructed of carbon steel. They are mounted above the secondary containment structure for unused hydraulic oil. The containment structure is in good condition and does not have any noticeable cracks or gaps. Flexible piping is used to withdraw the used oil from the storage tanks into a vacuum truck. When not in use, the hoses are placed on grating over the containment area.

The sumps are cleaned out and inspected at least one time each year. The pits under each press are also cleaned whenever the press is down. The pits are in good condition and present a low risk of releases to the environment. The underground pipe has not been either visually inspected or pressuretested since its installation. Appropriate further assessment for this area consists of pressure-testing the underground pipe.

22.4.2 Fabrication Plant

There are two used oil management systems in the Fabrication Plant: Hotline sumps and Cold Mill sumps. These systems are described separately in this Section. Appendix O lists each fabrication basement sump and includes information about the use and condition of each sump. Appropriate further assessment for this area consists of inspecting waste and coolant sumps for which the current condition is unknown.

Hotline Sumps

Each of the three hotline mills has a separate coolant recycling system as described in Section 2.5.4. The coolant well, receiving tank, filter, and return tank for each hotline rolling mill is an integral part of the production process. Hotline coolant is water-based and consists of 95 percent demineralized water with 5 percent mineral oil and emulsifiers. Coolant leaks from pumps and valves in the coolant recirculating system, along with "tramp" oils such as hydraulic fluid from the rolling mills and associated equipment, are collected in sumps cast into the basement. Each hotline mill has a main floor sump measuring 4 feet by 4 feet by 6 feet deep. The sump is continuously pumped when the rolling mill is in operation. The concrete base and walls of the sumps are one foot thick, reinforced, and cast such that no seams are located at the base. The sumps are cleaned out and inspected twice each year and are in good condition. Numerous shallow (up to 3 inches deep) troughs and collection points have been constructed in the floors of the hotline basements to direct the flow of coolant to the main sumps. Coolant is pumped continuously from the collection points to the main sumps. Until 1985, the use of leaded gear lubricants in the Hotline resulted in wasted coolant having a low concentration of lead. The Hotline basement sumps present a low risk of release to the environment.

Cold Mill Sumps

There are three rolling mills currently operating in the Cold Mill area: the 381 mill, the 384 mill, and the 386 mill. Past cold mill operations also included the 382 mill and the foil area. The coolant collection pan, receiving tank, and filter for each rolling mill is an integral part of the production process. Both the coolant and the hydraulic fluid in the cold mills is a kerosene weight petroleum product. Several sumps and troughs are cast into the concrete floors of the cold mill basements. All but two of the floor sumps handle coolant that is returned directly to the production process. Two sumps receive materials, such as water, that are incompatible with the coolant system. There are no hazardous constituents associated with Cold Mill coolant. The Cold Mill basement sumps present a low risk of release to the environment.

22.5 Wastewater and Stormwater Systems

Wastewater and stormwater systems at the Ravenswood facility are described in Section 2.5.7. Figure 2-10 identifies the industrial processes discharging to each NPDES outfall (001, 002, and 004). The remaining outfalls (003, 005, 006, and 007) receive only stormwater runoff. Appendix A-2 contains a map that delineates stormwater runoff areas at the facility. This section discusses Outfalls 002 through 007 separately. Outfall 001 is discussed in Section 22.3.

Storm, sanitary and industrial sewer were installed when the facility was constructed in the late 1950s with changes and additions to yard piping occurring as necessary since that time. Available drawings indicate that storm sewers are constructed of reinforced concrete pipe with tongue and groove or bell and spigot connections. Extra strength pipe was used under buildings, slabs, roadways, and railroads. Outfalls 002, 003, and 004 were reconstructed when the pool elevation of the Ohio River was raised in the early 1970's.

Outfall 002

Outfall 002 serves the Fabrication Plant. Industrial processes discharging to this outfall include cooling tower blowdown, contact and noncontact cooling water, Fabrication Garage washwater, laboratory wastewater, and neutralized demineralization backwash water. The NPDES permit for this outfall was based on the following industrial processes as specified in the Clean Water Act categorical standards for aluminum forming: rolling with neat oil, rolling with emulsions, solution heat treatment, and direct chill casting.

Stormwater that discharges through Outfall 002 originates from a large portion of the Fabrication and Cast House roofs, paved roadways between the Cast House and the Fabrication Plant, paved roadways west of the Fabrication Plant, the Storeroom receiving area, the Storeroom empty drum accumulation area, the fuel pump island, some outdoor storage areas for metal alloy "sows" (small ingots), and the ground in the vicinity of the Oil Recovery Ponds. Both industrial water and storm water flows to the 002 Interceptor Basin.

The 002 Interceptor Basin was constructed in the mid 1970's. The basin has a capacity of 870,000 gallons and is equipped with oil skimming equipment. The basin was bentonite-lined at the time of its construction. Sediments collected in the basin were removed in 1989 in association with the transfer of the property from Kaiser to Ravenswood Aluminum. The bentonite liner was replaced upon removal of the sediment. The sediment was tested for hazardous characteristics prior to disposal in the onsite Industrial Landfill. Table 22-3 summarizes the results of the sampling. The laboratory reports are included in Appendix A-2.

The discharge from the 002 Outfall is monitored twice per month for total cyanide and oil & grease, once per month for chromium, once per quarter for zinc, and annually for cadmium, lead, and mercury in accordance with the NPDES permit. Table 22-4 lists the constituents detected in the effluent. The stormwater permit application for Outfall 002 includes the results of sampling a qualifying rainfall event. The results of this sampling are summarized in Table 22-5.

Relatively few changes have occurred to wastewater and stormwater flow through the 002 Outfall. Prior to construction of the secondary sanitary wastewater treatment system (which discharges to the 004 Outfall), primary-treated sanitary wastewater from the Fabrication Plant was discharged to the 002 Outfall (and the 002 Interceptor Basin after it was constructed). The roof overlying the Hotline mills was recently diverted from the 001 Outfall to the Oil Recovery Ponds in a effort to reduce oil & grease discharges from the 001 Outfall.

Outfall 003

No industrial processes discharge to Outfall 003. Stormwater that discharges through Outfall 003 originates from the security area and truck-weighing facilities at the main plant entrance, the parking lot at the main plant entrance, small portions of the Reduction Plant and Cast House roofs, paved roadways and grassed areas between the Reduction Plant and the Cast House, the outdoor ingot storage area, the potroom scrubber area, covered outdoor "hog pens" (store materials such as dusts, road sweepings, bath, and alumina), the Kaiser Potliner Pile area, and the elephant shed area. In the past, the 003 Outfall received stormwater flow from areas of outdoor potliner management.

The 003 Outfall has not yet been sampled during a qualified rainfall event. When such sampling occurs, the constituents of concern will include oil & grease, biological oxygen demand, chemical oxygen demand, total suspended solids, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, total phosphorus, pH, aluminum, chromium, cyanide, fluoride, and zinc.

Outfall 004

Outfall 004 serves the Reduction and Carbon Plants. Industrial processes discharging to this outfall include cooling tower blowdown, contact and noncontact cooling water, Reduction Garage washwater, laboratory wastewater, Blocking Well discharges, and treated sanitary wastewater. Two internal outfalls are included with Outfall 004. Outfall 104 serves the cooling tower for anode contact cooling water. There is normally no flow from this outfall. Outfall 204 serves the secondary treatment plant.

Stormwater that discharges through Outfall 004 originates from the Reduction Plant and Carbon Plant roofs, paved roadways between the Carbon Plant and the Reduction Plant, paved roadways west of the Reduction and Carbon Plants, the Tank Farm area, several equipment laydown areas, the roof and area surrounding the potliner accumulation and breakout buildings, alumina handling areas, the storage area for green anodes, the storage area for baked anodes, storage areas for anode butts and burnoffs, the area around the carbon plant scrubber system, and pitch and coke raw material handling areas. Both industrial water and storm water flows to the 004 Interceptor Basin. Treated sanitary wastewater and blocking well discharges bypass the 004 Interceptor Basin. The only significant change that has been identified at the 004 Outfall is the addition of secondary treatment to the sanitary wastewater stream in 1974.

The 004 Interceptor Basin was constructed in the mid 1970's. The basin has a capacity of 1,222,000 gallons and is equipped with oil skimming equipment. The basin was bentonite-lined at the time of its construction. Sediments collected in the basin were removed in 1989 in association with the transfer of the property from Kaiser to Ravenswood Aluminum and again in 1995. The bentonite liner was replaced upon removal of the sediment. The sediment was tested for hazardous characteristics prior to disposal. Table 22-6 summarizes the results of the 1989 sediment sampling; Table 22-7 summarizes the results of the 1995 sediment sampling. The laboratory reports are included in Appendix A-2.

The discharge from the 004 Outfall is monitored twice per month for total cyanide, chromium, and oil & grease, quarterly for zinc, and annually for aluminum and cadmium in accordance with the NPDES permit. Table 22-8 lists the constituents detected in the effluent. The 004 Outfall is also subject to stormwater permitting. Outfall 004 has not yet been sampled during a qualified rainfall event. When such sampling occurs, the constituents of concern will include oil & grease, biological oxygen demand, chemical oxygen demand, total suspended solids, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, total phosphorus, pH, aluminum, antimony, cyanide, fluoride, nickel, benzo(a)pyrene, and fecal coliform.

Outfall 005

No industrial processes discharge to Outfall 005. Stormwater that discharges through Outfall 005 originates from the Rectifier Station, paved roadways and parking areas east of the Reduction and Carbon Plants, and office building roofs. No significant changes have been identified to activities within the Outfall 005 drainage area.

Outfall 005 discharges to a ditch that leads to Wildcat Creek. The 005 Outfall has not yet been sampled during a qualified rainfall event. When such sampling occurs, the constituents of concern will include oil & grease, biological oxygen demand, chemical oxygen demand, total suspended solids, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, total phosphorus, and pH.

Outfall 006

No industrial processes discharge to Outfall 006. Stormwater that discharges through Outfall 006 originates from the railroad, paved roadways, and parking areas east of the Fabrication Plant. No significant changes have been identified to the activities within the Outfall 006 drainage area.

Outfall 006 discharges to a ditch that leads to Spring Creek. The 006 Outfall has not yet been sampled during a qualified rainfall event. When such sampling occurs, the constituents of concern will include oil & grease, biological oxygen demand, chemical oxygen demand, total suspended solids, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, total phosphorus, and pH.

Outfall 007

No industrial processes discharge to Outfall 007. Stormwater that discharges through Outfall 007 originates from the railroad, paved roadways, and the Industrial Landfill. Much of the Outfall 007 drainage area is within the Ohio River floodplain. The Industrial Landfill has not been used since 1992. The temporary cover was replaced by a final cover in 1996.

Outfall 007 discharges to the Ohio River. The 007 Outfall has not yet been sampled during a qualified rainfall event. When such sampling occurs, the constituents of concern will include oil & grease, biological oxygen demand, chemical oxygen demand, total suspended solids, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, total phosphorus, pH, chloride, fluoride, sulfate, phenolics, aluminum, arsenic, barium, cadmium, chromium, iron, lead, manganese, mercury, silver, and selenium.

Potential to Release

All wastewater generated by industrial processes at the facility is collected, treated, and discharged in accordance with the NPDES permitting system. Stormwater from most of the active industrial areas of the site also passes through Interceptor Basins. Process wastewaters may contain low concentrations of some metals, many of which are present at similar concentrations in the industrial water supply. Small concentrations of oil are also associated with manufacturing processes at the facility. Stormwater from active industrial areas may contain oil and suspended solids from raw material handling. The Interceptor Basins effectively remove oil and suspended solids, preventing their release to the environment in potentially harmful concentrations. The oil is removed from the Interceptor Basins and placed in the Oil Recovery Ponds, which will be further investigated in the RFI. Suspended solids eventually build up as sediment at the bottom of the basins. These solids have very little potential to migrate from the basins. TCLP tests summarized in Tables 22-3, 22-6, and 22-7 show that hazardous constituents do not leach from the Interceptor Basin sediments. If hazardous constituents were dissolved in the wastewater and stormwater, they would be detected during NPDES monitoring. As shown on Tables 22-4 and 22-8, priority pollutant organics have not been detected at Outfalls 002 and 004. Some metals are present at very low concentrations. Although the existing data does not indicate a substantial potential for hazardous constituent migration from the Interceptor Basins, this conclusion is based on a limited amount of data. Further evaluation of Interceptor Basins 002 and 004 may provide a more conclusive demonstration of whether or not migration is occurring.

Outfall 007 receives stormwater from the Industrial Landfill area. In order to assess whether hazardous constituents have migrated from the Industrial Landfill, a sediment sample should be collected from a deposition area leading from the Industrial Landfill to the 007 Outfall.

Two areas of the facility have been identified where stormwater potentially affected by industrial activity is subject to overland flow and infiltration. The coke and solid pitch unloading building and the storage area north of the Carbon Plant.

The coke and solid pitch unloading building straddles a railroad spur located northwest of the reduction building. This building is shown on Figure 2-2A. Railcars of coke and solid pitch unload their contents into hoppers below the railroad tracks. A covered conveyor system moves the raw materials to their respective storage buildings. The ends of the building are open, enabling fugitive emissions to occur during material transfer. Stormwater in this area flows northward between the railroad tracks, under one set of tracks through a culvert, and then northward between the next set of tracks. Eventually, the stormwater flows through another culvert onto a sloping grassy area. Some particles of coke and pitch released from the unloading area may migrate with the stormwater flow during significant rainfall events. Samples should be collected in this migration pathway to determine if hazardous constituents have migrated via this pathway. Coke is essentially carbon, and is not expected to contain hazardous constituents. Solid pitch contains polynuclear aromatic hydrocarbons.

The storage area north of the Carbon Plant is used to manage waste oil from hydraulic presses in the Carbon Plant, "green" anodes, baked anodes, and miscellaneous equipment. Baked and "green" anodes are currently stored in an area protected by a roof, but have been stored in an unprotected area in the past. The storage of waste oil in this area is described in Section 22.4.1. This area is on the boundary between the drainage area for the 004 Interceptor Basin and an overland flow and infiltration drainage area to the north of the Carbon Plant. Eventually, the stormwater draining toward the north flows to a culvert that passes underneath three sets of railroad tracks to the lower terrace. Samples should be collected in this potential migration pathway to determine if hazardous constituents have migrated via this pathway. Hazardous constituents potentially migrating from this area include metals and organics from the waste oil and organics from the "green" anodes.

TABLE 22-1
SUMMARY OF NPDES APPLICATION ANALYSES - OUTFALL 001

PARAMETERS	NPDES PERMIT APPLICATION YEARS			
	1974 [a]	1979	1984 [a]	1992
Flow (million gallons per day)		0.113		0.112
pH (standard units)		6.0 - 8.9		4.75 - 8.2
Biochemical Oxygen Demand (mg/L)		4		11
Chemical Oxygen Demand (mg/L)		31		10
Total Suspended Solids (mg/L)		35		7.8
Specific Conductance (μmhos/cm)		10,300		--
Total Cyanide (mg/L)		0.033		BDL
Residual Chlorine (mg/L)		<0.2		BDL
Oil & Grease (mg/L)		4.5		5.2
Aluminum (mg/L)		--		0.2
Antimony (mg/L)		--		0.2
Barium (mg/L)		--		0.06
Cadmium (mg/L)		0.03		BDL
Chromium (mg/L)		0.024		BDL
Copper (mg/L)		0.04		0.02
Iron (mg/L)		--		0.27
Lead (mg/L)		0.23		BDL
Magnesium (mg/L)		--		9.2
Manganese(mg/L)		--		0.03
Mercury (mg/L)		<0.001		BDL
Nickel (mg/L)		0.15		BDL
Silver(mg/L)		--		BDL
Zinc (mg/L)		0.03		0.09
Total Phenols (mg/L)		--		BDL
Priority Pollutant Organics		--		BDL

[a] Application data on microfiche at DEP.

TABLE 22-2
SUMMARY OF STORMWATER SAMPLING RESULTS - OUTFALL 001

PARAMETER	GRAB DURING FIRST 30 MINUTES	FLOW WEIGHTED COMPOSITE
Oil & Grease	2 mg/L	NA
Biologieal Oxygen Demand	<3 mg/L	5 mg/L
Chemical Oxygen Demand	<5 mg/L	7 mg/L
Total Suspended Solids	7 mg/L	<5 mg/L
Total Kjeldahl Nitrogen	1.4 mg/L	1.6 mg/L
Nitrate plus Nitrite Nitrogen	2.4 mg/L	1.2 mg/L
Total Phosphorus	<0.1 mg/L	<0.1 mg/L
pH	6.8 Standard Units	NA
Cyanide, total	<0.01 mg/L	NA

data from 10/14/92 NPDES Storm Water Permit Application

TABLE 22-3
SUMMARY OF 1989 SEDIMENT SAMPLING RESULTS
002 INTERCEPTOR BASIN

PARAMETER	RESULT
EP Toxicity Arsenic, mg/L	<0.1
EP Toxicity Barium, mg/L	0.07
EP Toxicity Cadmium, mg/L	<0.01
EP Toxicity Chromium, mg/L	<0.02
EP Toxicity Lead, mg/L	<0.1
EP Toxicity Selenium, mg/L	<0.2
EP Toxicity Silver, mg/L	<0.01
EP Toxicity Mercury, mg/L	<0.0005
PCB, ug/g	<5.0

data reported in 10/25/89 correspondence, RAC to WV DNR - Div of Water Resources

TABLE 22-4
SUMMARY OF NPDES APPLICATION ANALYSES - OUTFALL 002

PARAMETERS	NPDES PERMIT APPLICATION YEARS			
	1974 [a]	1979	1984 [a]	1992
Flow (million gallons per day)		0.544		0.299
pH (standard units)		6.0 - 8.2		5.2 - 8.6
Biochemical Oxygen Demand (mg/L)		11		33
Chemical Oxygen Demand (mg/L)		47		130
Total Suspended Solids (mg/L)		15		16.6
Specific Conductance (μmhos/cm)		1,403		--
Total Cyanide (mg/L)		0.001		BDL
Chloride (mg/L)		--		73
Sulfate (mg/L)		--		91
Oil & Grease (mg/L)		5.2		7.44
Aluminum (mg/L)		--		0.281
Barium (mg/L)		--		0.08
Cadmium (mg/L)		<0.01		BDL
Chromium (mg/L)		0.024		BDL
Copper (mg/L)		--		0.023
Iron (mg/L)		--		0.26
Lead (mg/L)		0.09		BDL
Magnesium (mg/L)		--		17
Manganese (mg/L)		--		0.03
Mercury (mg/L)		<0.001		BDL
Nickel (mg/L)		0.04		BDL
Zinc (mg/L)		0.058		0.06
Total Phenols (mg/L)		--		BDL
Priority Pollutant Organics		--		BDL

[a] Application data on microfiche at DEP.

NOTE: Listed values are long term averages if available, or maximum detected. Constituents are listed if they were in the 1979 application.

TABLE 22-5
SUMMARY OF STORMWATER SAMPLING RESULTS - OUTFALL 002

PARAMETER	GRAB DURING FIRST 30 MINUTES	FLOW WEIGHTED COMPOSITE
Oil & Grease	3 mg/L	NA
Biological Oxygen Demand	3 mg/L	<3 mg/L
Chemical Oxygen Demand	28 mg/L	30 mg/L
Total Suspended Solids	8 mg/L	6 mg/L
Total Kjeldahl Nitrogen	1.3 mg/L	1.3 mg/L
Nitrate plus Nitrite Nitrogen	2.0 mg/L	2.1 mg/L
Total Phosphorus	0.4 mg/L	0.4 mg/L
pH	8.7 Std. Units	NA
Cyanide, total	<0.01 mg/L	NA
Aluminum, total	0.4 mg/L	<0.1 mg/L
Chromium, total	<0.02 mg/L	<0.02 mg/L
Zinc, total	0.04 mg/L	0.04 mg/L

data from 10/14/92 NPDES Storm Water Permit Application

TABLE 22-6
SUMMARY OF 1989 SEDIMENT SAMPLING RESULTS
004 INTERCEPTOR BASIN

PARAMETER	RESULT
EP Toxicity Arsenic, mg/L	<0.1
EP Toxicity Barium, mg/L	0.18
EP Toxicity Cadmium, mg/L	<0.01
EP Toxicity Chromium, mg/L	<0.02
EP Toxicity Lead, mg/L	<0.1
EP Toxicity Selenium, mg/L	<0.2
EP Toxicity Silver, mg/L	<0.01
EP Toxicity Mercury, mg/L	<0.0005
PCB, ug/g	<1.0
Benzo(a)pyrene, ug/g	200 and 370

data from 10/25/89 correspondence, RAC to WV DNR - Div of Water Resources

TABLE 22-7
SUMMARY OF 1995 SEDIMENT SAMPLING RESULTS
004 INTERCEPTOR BASIN

PARAMETER	RESULT
TCLP Arsenic, mg/L	<0.1
TCLP Barium, mg/L	0.6
TCLP Cadmium, mg/L	<0.1
TCLP Chromium, mg/L	<0.2
TCLP Lead, mg/L	<1
TCLP Selenium, mg/L	<1
TCLP Silver, mg/L	<0.1
TCLP Mercury, mg/L	<0.1
TCLP Volatile Organic Constituents, mg/L	none detected
TCLP Semivolatile Organic Constituents, mg/L	none detected
TCLP Pesticides	none detected
Oil & Grease, mg/kg	840 and 18,000
Total Cyanide, mg/kg	13
Total Aluminum, mg/kg	43,000 and 50,000
Total Arsenic, mg/kg	4.7 and 13
Total Barium, mg/kg	130 and 150
Total Cadmium, mg/kg	1.0 and 1.4
Total Chromium, mg/kg	13 and 15
Total Lead, mg/kg	43 and 62
Total Mercury, mg/kg	0.7 and 1.2
Total Selenium, mg/kg	<0.2
Total Silver, mg/kg	<2

data from 3/4/96 correspondence, WV DNR - Div of Environmental Protection to Northwestern Disposal Sanitary Landfill

TABLE 22-8
SUMMARY OF NPDES APPLICATION ANALYSES - OUTFALL 004

PARAMETERS	NPDES PERMIT APPLICATION YEARS			
	1974 [a]	1979	1984 [a]	1992
Flow (million gallons per day)		1.36		2.59
pH (standard units)		6.0 - 8.1		7.1 - 8.3
Biochemical Oxygen Demand (mg/L)		7		7
Chemical Oxygen Demand (mg/L)		32		BDL
Total Suspended Solids (mg/L)		14		3.71
Specific Conductance (μmhos/cm)		1,240		--
Total Cyanide (mg/L)		2.9		0.64
Residual Chlorine (mg/L)		<0.2		BDL
Oil & Grease (mg/L)		3.1		1.01
Aluminum (mg/L)		0.2		0.4
Barium (mg/L)		--		0.11
Cadmium (mg/L)		0.02		BDL
Chromium (mg/L)		0.022		BDL
Copper (mg/L)		<0.01		0.021
Iron (mg/L)		--		0.08
Lead (mg/L)		0.17		BDL
Magnesium (mg/L)		--		13
Manganese (mg/L)		--		0.035
Mercury (mg/L)		<0.001		BDL
Nickel (mg/L)		0.02		BDL
Zinc (mg/L)		0.018		BDL
Total Phenols (mg/L)		--		BDL
Priority Pollutant Organics		--		BDL

[a] Application data on microfiche at DEP.

NOTE: Listed values are long term averages if available, or maximum detected. Constituents are listed if they were in the 1979 application.

23.0 SITE GROUNDWATER QUALITY

The previous sections of this report have discussed the various areas listed as SWMUs in the 1988 RFA Report by Versar (US EPA Contractor) and other areas considered for the RFI. These previous sections have also presented the results of localized soil studies performed in these areas and recommendations for further investigations where appropriate. This section presents information about the groundwater quality at the facility. For the purpose of groundwater assessment in the RFI, the facility has been divided into six areas as follows:

- Areas of Former Potliner Management,
- Oil Recovery Pond Area,
- Industrial Landfill,
- Old Landfill,
- Sprayfield, and
- Outfall 001 Conveyance.

This section is divided into six major sections and an overall conclusions section. Each of the six major sections describes one of the areas listed above. Plate 9 delineates areas where groundwater monitoring is performed at the facility. The sections present the results of previous groundwater studies as determined by sample analyses of groundwater collected from the plant wells. The locations of the plant wells are shown on Plate 2, and the construction details for the wells are provided in Table 3-2 of this DCC Report. Section 23.0 also presents an assessment of further investigation needs for each of the groundwater areas.

As stated in Section 3.2.2, the natural direction of the groundwater flow under non-pumping conditions is from the valley wall towards the Ohio River. However, RAC currently extracts groundwater from the blocking wells and production wells F-8 and F-9, and this extraction affects groundwater flow at the facility. In addition, the operation of the Sprayfield also affects groundwater flow by producing groundwater mounding in the underlying upper clayey silt unit. Groundwater in the northern and central areas of the facility flows toward the blocking wells, while groundwater in the southern section of the site flows toward the production wells. Except for this area of mounded groundwater, groundwater flow across the site is from the Ohio River toward the pumping wells (see Plate 8 and Table 3-1 for information on groundwater elevations). More detailed information on the groundwater at the facility is presented in Section 3.0

23.1 GROUNDWATER IN THE AREAS OF FORMER POTLINER MANAGEMENT

Prior to 1979, spent potliner was managed and accumulated outside at the facility. This practice resulted in leaching of cyanide from the potliner into the groundwater from certain Areas of Former Potliner Management. These areas include the Old Northwest Pot Dump, Pot Soaking Piers, Pot Soaking Pits and Elephant Shed, Potliner Loadout Area, and the Potliner Pile. In 1969, the presence of total cyanide in some of the facility wells was discovered. At that time, an effort was undertaken to control the migration of cyanide in groundwater.

Six groundwater recovery wells are used to control groundwater flow and to contain and remove the cyanide present in groundwater. These recovery wells are referred to as Blocking Wells and are described in Section 23.1.2. Most of the groundwater recovery system has been in operation since the mid 1970s. The extracted groundwater is discharged to the Ohio River through Outfall 004 in accordance with RAC's NPDES Permit. A description of the Areas of Former Potliner Management at the facility is provided in Section 4.0, along with a discussion of the issue relevant to cyanide.

23.1.1 Cyanide Concentrations in Groundwater

Since the discovery of cyanide in the groundwater at the facility in 1969, several investigations have been conducted to characterize groundwater quality in the Areas of Former Potliner Management. Monitoring of groundwater quality in the Blocking Wells and DM-series wells is ongoing. The results of the past studies and monitoring as they pertain to the cyanide in the groundwater are detailed in the following sections.

Leggett, Brashears, and Graham, 1971 Preliminary Study of Cyanide Sources

In 1969, the presence of cyanide was detected in some of the facility's production wells (Leggett, Brashears and Graham, *Preliminary*, 1971). From 1969 to 1971, total cyanide analysis was performed on groundwater samples collected from wells R-1, R-2, R-3, and F-3. The results of the analyses are provided in Table 23-1.

Dames & Moore, 1982 Hydrogeologic Investigation

In 1982, Dames & Moore performed a hydrogeologic investigation at the site specifically aimed at further defining the extent of cyanide in the groundwater in the Areas of Former Potliner Management. During the hydrogeologic investigation, Dames & Moore installed 11 monitoring wells (DM-1 through DM-11; DM-11 has been renamed MW-1) (Dames & Moore, *Comprehensive*).

Kaiser Aluminum and Chemical Corporation (Kaiser), 1996 Investigation of the Potliner Pile

In 1996, Kaiser conducted an RFI on the Potliner Pile, of which they retained ownership when the Ravenswood facility was sold to Ravenswood Aluminum Corporation. The investigation included the installation of three monitoring wells adjacent to the pile, collection and analysis of groundwater samples, and collection and analysis of soil samples (CEC, *Potliner*).

Groundwater samples were collected from the three newly installed wells in May, August, and September 1996. Groundwater samples were analyzed for total cyanide, weak-acid dissociable cyanide, free cyanide (microdiffusion method), fluoride, and total dissolved solids. Samples collected during the first two rounds were also analyzed for chloride and sodium. The results of the groundwater analyses are provided on Table 23-2. The data show that the cyanide present in these wells is predominantly in a complexed form.

Quarterly Monitoring Around the Potliner Vault

Since 1987, groundwater samples from the monitoring wells W-1 (previously DM-6), W-2, and W-3 have been analyzed for total cyanide concentrations on a quarterly basis. These wells are located around the Potliner Vault, which continues to be owned by Kaiser. The locations of these wells are shown on Plate 2. The average total cyanide concentration measured in W-1 is 0.07 mg/L, with a maximum of 0.17 mg/L. The average total cyanide concentration measured in W-2 is 0.15 mg/L, with a maximum of 0.80 mg/L. Finally, the average total cyanide concentration measured in W-3 is 0.07 mg/L, with a maximum of 0.22 mg/L. In general, the cyanide concentrations in wells W-1 and W-2 have been decreasing since late 1992. The average concentration of total cyanide in both of these wells for 1993 and 1994 was 0.02 mg/L. The cyanide concentrations in W-3 have not shown any obvious trend since the monitoring began in 1987 (see Appendix N-1 for analytical results).

Blocking Wells and DM-Series Well Monitoring

During past monitoring events, samples of the groundwater pumped from the blocking wells, the DM-series monitoring wells, and other plant production wells have been analyzed for cyanide (Geraghty & Miller, *1993 Annual*). These data and graphs of these data are contained in Appendix N-1. Other groundwater parameters were also analyzed in groundwater samples from the DM-series wells, and these data are also contained in Appendix N-1.

Total cyanide concentrations were monitored usually six to twelve times per year in blocking wells R-1, R-2, R-3, and F-3 from 1969 to 1983; wells F-1, F-2, and F-4 from the early 1970s to 1983; and wells R-4, R-7, and F-7 from 1977 to 1983. A summary of the reported total cyanide concentrations from these wells is presented in Table 23-3 (see Appendix N-1 for graphic representation of this data).

From 1984 to the present, the monthly blocking well discharge samples from R-1, R-2, R-3, R-4, F-1, and F-3 (replaced by F-10 in 1990) have been analyzed for total and free cyanide. Additionally, the discharge from Outfall 004, which includes all Blocking Well discharges in addition to sanitary, process, and storm water, is monitored on a monthly basis in accordance with the NPDES permit. For most of the sampling period, free cyanide was measured using the microdiffusion technique. From November 1990 through March 1992, the "free" cyanide was analyzed using the cyanide amenable to chlorination method, which reports higher cyanide concentrations than the microdiffusion technique. With the exception of the data that were analyzed using the cyanide amenable to chlorination method, the free cyanide concentrations have been near or below detection limits. The total cyanide concentrations in the Blocking Wells are shown in Figure 23-1a through Figure 23-1f. There are 11 DM-series wells at the facility. These wells along with RT-5, have been monitored quarterly from 1981 to the present for total cyanide concentrations. Groundwater samples collected from the Dames & Moore wells from this time period indicate the general trends in total cyanide concentrations as shown in Figures 23-2a and 23-2b (see Appendix N-1 for analytical results). Monitoring of cyanide concentrations and general groundwater quality parameters in these wells is conducted on a quarterly basis as required by NPDES Permit.

RFA Groundwater Samples

During the 1987 RFA Sampling Visit, US EPA's contractor, Versar, collected groundwater samples from monitoring wells DM-1 and DM-4. These samples were analyzed for TCL volatile organics, total metals, and cyanide. No volatile organics were detected. Cyanide was detected in DM-1 at 17.5 mg/L and in DM-4 at 0.12 mg/L. Table 23-4 presents the results of the metals analyses. The Versar cyanide results were consistent with routine monitoring results for those wells.

Total Cyanide Isoconcentration Maps

Total cyanide isoconcentration maps were generated for three sets of data. The first data set was collected in 1981 during Dames & Moore's Comprehensive Hydrogeologic Investigation. The second data set was collected in September 1994, and the third data set was collected in January 1996. The isoconcentration maps are presented on Plate 10. Each map shows two areas of affected groundwater. One area underlies the Old Northwest Pot Dump and its drainage pathway. The other area underlies Kaiser's Spent Potliner Pile and the former potliner management areas immediately adjacent to it. Between 1981 and 1996, the area of affected groundwater underlying the Old Northwest Pot Dump diminished by about half. During the same time interval, the area of affected groundwater underlying the Spent Potliner Pile also diminished by about half. The maximum concentration in this area decreased by a factor of five. Relatively little change has occurred in the two areas of affected groundwater from September 1994 to January 1996. Section 23.1.2 includes a discussion of total cyanide removal by the Blocking Well system.

23.1.2 Blocking Well System

Since construction of the plant began in 1955, fourteen water supply wells have been installed to meet the process and potable water supply needs of the facility. The locations of these wells are shown on Plate 2. The R-series wells (R-1 through R-4 and R7) were installed to provide potable and industrial process water to the Reduction Plant. Wells F-1 through F-7 were installed to provide potable and industrial process water to the Fabrication Plant. In October 1981 wells F-8 and F-9, installed at the southern end of the facility, were put into operation to provide industrial process water and potable water to the entire plant. Water is generally supplied by well F-9, with F-8 serving as a standby unit. Currently, wells F-8 and F-9 provide the only source of potable water to the facility. Wells F-2, F-4, F-5, F-6, F-7, and R-7 are not used on a regular basis, but may be pumped to satisfy additional process water supply demands not met by wells F-8 and F-9. The operational history of these wells is not completely documented for the period the wells have been in use at the facility.

Four of the water supply wells (R-2, R-3, R-4, and F-3) were dedicated in 1976 for use as Blocking Wells to recover groundwater containing dissolved cyanide and to maintain a hydraulic gradient from the Ohio River toward the facility. In October 1981, well R-1 was added to the blocking well system. Well F-1 was added to the system after 1982. Well F-3 was replaced by well F-10 in 1990 because encrustation had seriously affected the specific capacity of the well.

Description of the Blocking Wells

Currently, six wells are designated as blocking wells: R-1, R-2, R-3, R-4, F-1, and F-10. These wells are installed near the base of the alluvial aquifer at depths of 105 to 116 feet below land surface. Available records indicate the wells are completed with approximately 15 feet of well screen situated near the bottom of the well. Available construction information for the Blocking Wells is summarized on Table 23-5. Each blocking well is equipped with a turbine pump. The Blocking Wells are connected to a manifold that discharges to the Ohio River via NPDES Outfall 004. The approximate range of pumping rates for each of the blocking wells is presented on Table 3-3. Pumping rates are measured during annual maintenance of the blocking well system and after any necessary repairs are conducted throughout the year.

Pumping of the blocking wells is essentially continuous, and is only interrupted during maintenance of a pump or cleaning of the well casing and screen. RAC personnel check the pumps daily to ensure operation. Necessary maintenance is performed on a timely basis. RAC maintains spare pumps on site to minimize down time. In addition, an outside contractor performs annual inspection and maintenance of the blocking well system. Specific capacities of the individual wells are measured to determine if the wells require cleaning. Pumps are inspected, cleaned, or replaced as necessary.

Influence of Blocking Well System on Groundwater Flow

The influence of the Blocking Well System on groundwater flow conditions in the cyanide-affected areas is illustrated by the configuration of the water table observed at the site. Water level data for May 1981 and August 1994 have been contoured to evaluate groundwater flow directions in the alluvial aquifer relative to conditions observed in 1996. These dates were selected based on the availability of water level data. These potentiometric surface maps are presented on Plate 11. The cone of depression created by pumping the Blocking Wells is evident on each of the potentiometric surface maps. A consistent ground water flow pattern is observed, with ground water movement occurring from the Ohio River (where the water level is observed generally to be an elevation of approximately 560 feet MSL) towards the Blocking Wells situated near the main plant area (where water levels are observed generally to be 557 to 558 MSL). Low hydraulic gradients are observed in the alluvial aquifer, generally ranging from 0.001 feet/foot to 0.002 feet/foot from the river toward the Blocking Wells.

Available information indicates the Blocking Wells are positioned vertically within the alluvial aquifer at depths comparable to the monitoring wells and the occurrence of cyanide, as shown on Plate 12. Thus, pumping of the wells would induce horizontal movement of ground water in the alluvial aquifer, influencing movement of cyanide toward the pumping wells and away from the Ohio River and inducing flow of water from the river into the shallow alluvial aquifer. The area hydraulically influenced by the Blocking Wells extends beyond the area of groundwater affected by cyanide concentrations above the drinking water standard.

Cyanide Recovery/Aquifer Remediation

Dames & Moore (Dames & Moore, *Comprehensive*) used the results of their 1982 soil analyses to estimate the amount of cyanide present in the unsaturated zone at the time of their investigation. The estimates were based on total cyanide concentrations determined by the method described in Section 4.4.1. The potliner management areas were divided into zones, each centered on each soil sample. Areas in the unsaturated zone that were not sampled, such as the volume between the deepest samples and the water table, were assumed to have a zero concentration for the minimum estimate and the concentration equal to the nearest overlying sample for the maximum estimate. Table 23-6 summarizes the results of these calculations. The estimate for total cyanide in soils ranged from 33.5 to 132.5 tons. The largest single contributor was the soils surrounding the Cathode Waste Storage Pile, now known as Kaiser's Spent Potliner Pile, which contributed between 66 and 87 percent of the total.

Groundwater cyanide concentrations can likewise be used to estimate the mass of cyanide present in the saturated zone during the 1982 Dames & Moore investigation and during the January 1996 groundwater sampling event. This was accomplished by estimating the volume of groundwater represented by selected total cyanide concentration ranges. The cyanide concentration for a given area was assumed to be consistent throughout the 40-foot aquifer thickness. The results are about 4.5 tons of total cyanide in 1982 and about 0.5 tons in 1996. Because of the small number of data points, these estimates have a high degree of uncertainty. However, they do show that a smaller mass of cyanide resides in the groundwater in 1996 than in 1982.

The estimated 4 ton difference in total cyanide mass within the saturated zone between 1982 and 1996 is more than accounted for by cyanide removal in the Blocking Well system. During this time frame, regular samples were collected from each Blocking Well for total cyanide analysis. Detailed records of Blocking Well pumping rates were not kept. However, ranges of pumping rates are available for each Blocking Well are available, as summarized in Table 3-3. Using estimated typical pumping rates for each Blocking Well, the amount of cyanide removed by that Blocking Well can be calculated. Table 23-7 presents the results of these calculations. Total cyanide removed from the Blocking Well system is estimated to be 55 tons. Figures 23-1a through 23-1f show the total cyanide concentration in each Blocking Well over time. These figures also indicate cumulative cyanide removal from the well.

These data and calculations indicate that 40 percent (based on Dames & Moore's high estimate) to more than 100 percent (based on their low estimate) of the cyanide estimated to be present in the soil and groundwater in 1982 has been removed through the Blocking Well system. Soil sampling in areas of former potliner management during the RFI will provide an estimate of residual cyanide in the unsaturated zone. These preliminary calculations, however, show that the Blocking Well system provides an effective remediation for total cyanide at the site.

23.1.3 Assessment of Additional Groundwater Investigation Needs

Available data concerning the groundwater in the areas of former potliner management indicates that groundwater has been affected by previous outdoor potliner storage. The most significant former source areas appear to be the Old Northwest Pot Dump and the Potliner Pile. The potliner has been removed from the Old Northwest Pot Dump, and the Potliner Pile has been closed with a cap system. Residual cyanide concentrations in the soil provide a diminishing source of cyanide to the groundwater, as discussed in Section 23.1.2. The Blocking Well system is providing complete capture of the groundwater in the area affected by cyanide releases, as discussed in Section 23.1.2. Figures 23.1a through 23.1f demonstrate that the Blocking Wells are removing cyanide from the aquifer. Plate 10 demonstrates the extent to which the Blocking Well system has reduced groundwater cyanide concentrations during the last

15 years. Operation of the Blocking Well system provides a continuing corrective measure for removing cyanide from the areas of former potliner management.

Additional sampling of soils in the areas of former potliner management is discussed in Section 4 of this report. This data will provide information about remaining cyanide concentrations in the soil. No additional groundwater investigations are necessary to evaluate the effectiveness of the Blocking Well system as a corrective measure for cyanide in the soils and groundwater in the areas of former potliner management.

23.2 AREA SURROUNDING THE OIL RECOVERY PONDS

The construction and operation of the Oil Recovery Ponds at the facility is described in Section 9.0 of this report. Section 9.0 also presents the recommendations for further soil sampling in the area of the Oil Recovery Ponds. The following section presents the information relative to groundwater quality in the vicinity of the Oil Recovery Ponds and recommendations for groundwater sampling in this area.

23.2.1 Investigation of Groundwater Quality

The presentation of groundwater quality in the vicinity of the Oil Recovery Ponds is divided into two sections: pre-1989 and post-1989. This division is made because analyses performed prior to 1989 were made on groundwater samples collected through the floating oil in those wells with floating oil (*i.e.*, WP-1 and WP-2). Therefore, organics and other constituents reported in these groundwater samples may actually have been caused by the presence of oil in the groundwater samples does not represent dissolved constituents concentrations.

23.2.1.1 Pre-1989 Groundwater Quality Information

Several pre-1989 reports by consultants noted floating oil in monitoring wells in the Oil Recovery Pond area. The 1983 Dames & Moore report on the installation of the WP-series wells noted floating oil in WP-2. The 1987 IT Corporation report on their site investigation activities mentioned floating oil in WP-1, WP-2, an IT-1s.

Analyses of groundwater samples collected by IT in 1987 reported low concentrations of organics, including chloroethane, ethylbenzene, 1,1-dichloroethane, toluene, and xylenes in some of the samples (see Appendix N-2 for analytical results). However, the groundwater samples for which organics were detected were those that were collected through the floating oil and the results could have been attributed to small amounts of oil cross-contamination in the samples. Therefore, these results may not be a true indication of groundwater quality in the wells.

Versar collected two groundwater samples during their RFA Sampling Visit in 1987. One of these groundwater samples was collected in a well with floating oil (MW-2) and the other was collected in a well without floating oil and upgradient of the ponds (FT-1). The samples were analyzed for TCL volatile and semivolatile organics, oil and grease, and cyanide. No volatile organics were detected in the samples collected from FT-1, and the only semivolatile organic detected was chrysene. Barium and lead were detected in the sample collected from WP-2, but these constituents could have been attributed to oil in the sample. All analytical results for these samples are presented in Appendix D-1, D-2, and D-3.

23.2.1.2 1989 Part B Post-Closure Permit Application

During the spring and summer of 1989, Geraghty & Miller performed a hydrogeologic investigation around the Oil Recovery Ponds to provide the additional Part B Permit Application information required by 40 CFR 270.14(c)(4). The objectives of this program included establishing a system of new and existing monitoring wells to facilitate accurate mapping of groundwater flow patterns, measurement of floating oil thickness, and collection of representative groundwater samples. The subsurface investigation was conducted to assess the migration and general areal extent of oil floating on the groundwater and to identify groundwater quality alterations, if any, related to past releases from the Oil Recovery System. Groundwater samples were analyzed for constituents listed in Part 264 Appendix IX. This effort resulted in the installation of eight additional monitoring wells, GM-1 through GM-8, around the Oil Recovery Ponds (see Plate 2 for well locations).

Upgradient well GM-8 provides groundwater samples that are representative of the quality of groundwater passing beneath the Oil Recovery Pond area. Wells GM-5 and GM-7 are within the area containing floating oil. Wells GM-1 and GM-2 are downgradient of the oil that is floating on the groundwater. Wells GM-3, GM-4, and GM-6 appear to be cross-gradient from the floating oil. The extent of the floating oil as determined by the Geraghty & Miller investigation is discussed in Section 9.0 of this DCC report. Figure 23-3 shows the groundwater flow direction in the vicinity of the Oil Ponds and the locations of the monitoring wells. The boundary within which water table wells contain floating oil is shown in this figure.

Sampling for Appendix IX Constituents

In 1989, groundwater quality beneath and downgradient of the floating oil was assessed by the collection and analyses of groundwater samples from five of the new GM-series wells. These wells were sampled for Appendix IX constituents as well as other general water quality parameters. An assessment of Appendix IX constituents within the groundwater beneath the Oil Recovery Ponds was based upon comparison of the background data from GM-8 with the data from GM-7, downgradient wells GM-1 and GM-2, and well GM-3.

Floating oil was present in monitoring well GM-7. This required a modification of the sampling procedures for the sample fraction to be analyzed for volatile organic compounds, lead, and barium. Prior to sampling, the oil phase was bailed off and containerized. Groundwater samples to be analyzed for volatile organic compounds, lead, and barium were then collected using a combination pipet and peristalitic pump designed to minimize the presence of oil in the sample. Although this technique minimized incorporation of free oil into the groundwater sample, a film of free oil was still observed in the GM-7 sample. A review of the Appendix IX organic parameters detected in well GM-7 reveals minimal impacts to the sampled groundwater, despite the difficulties in sampling through the floating oil.

Appendix IX Constituent Analysis

The results of the Appendix IX analyses were presented in Tables 10 through 13 in the Part B Post-Closure Permit Application. These tables are included in Appendix N-2. Trace levels of barium and lead were detected in one or more of the groundwater samples; however, concentrations of the constituents were generally below primary drinking water standards. Barium was detected in the sample obtained from well GM-7, probably reflecting some contribution from oil visibly present in the water sample that was collected from this well. Subsequent monitoring of well GM-7d (adjacent to GM-7) indicated appreciably lower barium concentrations, supporting the hypothesis that the barium initially reported in GM-7 reflected the presence of the floating oil in the water sample.

The vast majority of the volatile organic compounds and semivolatile organic compounds consisted primarily of estimated values below the detection limit. Volatile constituents that appeared above detection limits included chlorobenzene, methylene chloride, and acetone. Of these volatile constituents, methylene chloride and acetone (at trace levels) are commonly associated with laboratory-related contributions, as evidenced by the detection of these compounds in the field blank.

Three Appendix IX semivolatile organic compounds, phenanthrene, naphthalene, and 2-methyl-naphthalene, were detected in groundwater samples from monitoring well GM-7. Because of observed oil in the sample obtained for the semivolatile analysis, it was not clear at that time whether these analytical results represented dissolved compounds in the groundwater or whether they were a result of the oil in the sample itself. To investigate this issue, another well, GM-7d, was installed near the GM-7 location in September 1990. The new GM-7d (deep) well was screened beneath the floating oil. GM-7 was thereafter called GM-7s (shallow).

The groundwater in well GM-7d was sampled quarterly for 1 year, during which no Appendix IX semivolatile constituents were detected. Since no Appendix IX semivolatile compounds were detected during the year of monitoring, their detection in 1989 was attributed to the visible oil in the sample from GM-7 (see Appendix N-2 for these four quarters of Appendix IX analytical results). These analytical results indicated that there have been no substantial groundwater quality impacts from the floating oil in the vicinity of the Oil Recovery Ponds.

23.2.1.3 Annual Groundwater Monitoring Information Reports

Geraghty & Miller has performed groundwater monitoring at the facility from 1990 to the present. The wells monitored are GM-1, GM-2, GM-4, GM-7d, and GM-8. Well GM-7d is located adjacent to GM-7s, but it is screened below the oil floating on the groundwater. The groundwater monitoring has indicated that there have been no substantial impacts from the floating oil to the groundwater in the vicinity of the Oil Recovery Ponds (Geraghty & Miller, *1989 Part B;* Geraghty & Miller, *1990;* Geraghty & Miller, *1991;* Geraghty & Miller, *1992;* Geraghty & Miller, *1993;* Geraghty & Miller, *Supplemental).* These data are contained in Appendix N-2. Analyses of groundwater samples from GM-1, GM-2, GM-4, GM-7d, and GM-8 for total organic carbon, total organic halogens, and general groundwater quality parameters is ongoing on a quarterly basis.

23.2.1.4 Summary of Groundwater Investigation (1989 to Present)

Extensive groundwater monitoring has been performed in the area of floating oil. All monitoring to date has indicated that the floating oil has not adversely impacted the groundwater quality beneath or downgradient of the floating oil.

23.2.2 Assessment of Further Groundwater Investigation Needs

Extensive groundwater quality analyses have been performed on groundwater samples collected in the vicinity of the Oil Recovery Ponds. These analyses have indicated that the floating oil has had no substantial impact on groundwater quality. The RCRA Consent Order that required the preparation of this DCC report also required the preparation of an IM Workplan addressing the oil floating on the groundwater in the vicinity of the Oil Recovery Ponds. The IM Workplan proposed the installation of one or more oil recovery pumps to remove the floating oil. The IM Workplan also included analyses of the floating oil and further monitoring of the floating oil thickness and groundwater quality in the vicinity of the Oil Recovery Ponds. This monitoring will allow assessment of the extent of the floating oil downgradient of the Oil Recovery Ponds and the effects, if any, of the floating oil on groundwater downgradient of the Oil Recovery Ponds. Since floating oil appeared in well WP-3 in 1993, one well should be installed north of WP-3 to better define the extent of the floating oil. This well, designated MW-5, will be used only to determine the thickness of the floating oil at the location, if any oil is present, and will not be used to analyze groundwater. The details of the floating oil monitoring in the area around the Oil Recovery Ponds are provided in the Data Collection Quality Assurance Plan of the RFI Workplan.

23.3 AREA SURROUNDING THE INDUSTRIAL LANDFILL

The construction and operation of the Industrial Landfill at the facility is presented in Section 17.0 of this report. The following section summarizes the investigations relative to groundwater quality in the area of the Industrial Landfill and details further investigations proposed for the area.

23.3.1 Investigation of Groundwater Quality

In compliance with KACC's and RAC's DEP Solid Waste/NPDES Permit(s), groundwater sampling of the Industrial Landfill monitoring wells (MW-1 through MW-4, LF-1, and LF-2) has been performed quarterly since 1987. Groundwater samples from these wells have been analyzed for general groundwater quality parameters (metals, pH, alkalinity, etc.) since 1987. In 1989, several other water quality parameters (TOH, specific conductance, oil and grease, phenolics, toluene, xylenes, etc.) were added to the list of parameters for analyses (see Appendix N-3). In May 1994, groundwater sampling was initiated in newly installed monitoring wells LF-3 through LF-7. In addition to the general groundwater quality parameters list, groundwater samples from the new wells and well K-209 have been analyzed for Priority Pollutant List volatile and semivolatile organic compounds and a list of inorganics which was developed as part of the permitting process. Table 17-4 summarizes groundwater monitoring results in the Landfill area.

For the 1988 RFA Report, Versar collected groundwater samples from LF-2 and MW-1 in the area of the Industrial Landfill. These groundwater samples were analyzed for TCL volatile organic and semivolatile organics, total metals, and cyanide. No organics or cyanide were detected in the sample collected from LF-2; however, the presence of barium was detected. No constituents of concern were detected in the sample collected from MW-1 (see Appendix D-1, D-2, and D-3 for analytical results).

In 1991 Dames & Moore prepared a groundwater assessment report for the Industrial Landfill. This report used existing groundwater elevation data to develop piezometric contour maps and analyzed the data collected in the Industrial Landfill monitoring wells up to that time. Based on the piezometric maps that they developed, Dames & Moore indicated that the groundwater flow direction below the landfill is stagnant or indeterminate because of the combined influences of the blocking wells, production wells F-8 and F-9, and the natural groundwater flow. The report concluded that the groundwater in the vicinity of the plant, including the landfill, was confined to the facility because of the pumping action of the production wells and the blocking wells. The report also concluded that concentrations of chlorides, iron, lead, sulfate, and total dissolved solids appear to be decreasing. These decreasing trends may be partially due to the placement of a clay cover over most of the landfill in 1987 through 1989.

In May 1994, groundwater sampling was initiated in monitoring wells LF-3 through LF-7 and K-209. In May, July, and October of 1994, groundwater samples from these LF-series wells were analyzed for Priority Pollutant List volatile organics and semivolatile organic compounds. These analyses, summarized in Table 17-4, indicated no detection of any of these organic parameters except for the report of 1,1-dichloroethane in the sample from LF-5 in May, and in the samples from LF-7 in July and October (see Appendix N-3 for analytical results). This was the only organic compound detected in any of the samples analyzed in the three sampling events.

23.3.2 Assessment of Further Groundwater Investigation Needs

During the RFI, groundwater samples were collected from select existing wells in the vicinity of the Industrial Landfill. These samples were analyzed using SW-846 methodologies. It should be noted that the October 1994 analyses were performed using SW-846 methods for all permit parameters, but for organic compounds, the Priority Pollutant List organic compounds were reported instead of the Appendix IX parameter list. The results of the groundwater sampling from the Industrial Landfill monitoring wells will be used in conjunction with other data collected pursuant to the ongoing permit monitoring program to satisfy the monitoring and reporting requirements for the Industrial Landfill's closure permit. Water levels were measured in all monitoring wells in this area on January 18, 1996, to further assess the groundwater flow rate and direction. The results of the groundwater sampling around the Industrial Landfill will be provided in the RFI Report.

23.4 AREA SURROUNDING THE SPRAYFIELD

The construction and operations of the Sprayfield is described in Section 11.0. Section 11.0 also summarizes analytical data on soils in the area of the Sprayfield and the need for further investigations into the soil quality in this area. The following section presents a summary of the results of the groundwater quality studies performed in the area of the Sprayfield and the additional sampling performed as part of the RFI.

23.4.1 Investigations of Groundwater Quality

23.4.1.1 Quarterly Groundwater Sampling

The Sprayfield's WPC Permit required that RAC perform quarterly groundwater monitoring for general groundwater quality parameters. The quarterly groundwater monitoring results from the mid 1980s for wells in the Sprayfield area are contained in Appendix N-4. Beginning in the first quarter of 1994, the Consent Order for the Sprayfield added aluminum, antimony, and Priority Pollutant List volatile organics to the list of parameters to be sampled on a quarterly basis. The sampling of the above mentioned parameters is ongoing on a quarterly basis as required by the Consent Order.

Lead Concentrations

Lead has been detected periodically during quarterly sampling events at varying concentrations in the K-200-series Sprayfield monitoring wells (Geraghty & Miller, *Sprayfield Treatment*). From the June 1989 first sampling of the newly-installed GM-series wells through October 1992, lead was detected in monitoring wells K-201 through K-207 at concentrations ranging from not detected to 0.54 mg/L. During 1990, lead was not detected in any of the K-200 series wells. However, detection limits ranged from 0.085 to 0.3 mg/L during this time period. There appears to be a decreasing trend in lead concentrations reported from June 1989 to October 1992 (see Figure 11-3). The Oil Recovery System was closed in 1989 under interim status and all the lead residuals were removed from the system (see Appendix N-4 for analytical results). Lead in the Sprayfield influent dropped significantly after the interim status closure, as shown in Figure 11-4.

Discounting the 1990 data, there appears to be a decreasing trend in the concentrations of lead detected during the June 1989 to October 1992 period. Noting that 1989 was the year that all residuals were removed from the Oil Recovery System pursuant to the Oil Recovery Pond interim status closure, this apparent trend may be understandable. Residuals in the system until 1989 may have contained some concentrations of lead from prior use of leaded lubricants. The lead concentrations detected in the K-200-series monitoring wells during the October 1992 sampling event ranged from 0.007 to 0.01 mg/L.

In June 1989, DNR performed a Compliance Sampling Inspection of the Sprayfield K-200-series monitoring wells (Geraghty & Miller, *Sprayfield Treatment*). During the sampling event, samples were analyzed by both DNR and RAC. Lead was detected in DNR groundwater samples at concentrations ranging from 0.032 to 0.094 mg/L (see Appendix N-4 for analytical results).

Another Compliance Sampling Inspection was performed by DNR in April 1992 (Geraghty & Miller, *Sprayfield Treatment*). Lead was detected in the DNR sample from K-209 at a concentration of 0.06 mg/L. Lead was not detected in the corresponding RAC sample; however, the detection limit was 0.085 mg/L for RAC's samples (see Appendix N-4 for analytical results).

The decreasing concentration of lead in the groundwater from June 1989 through October 1992 continues in the samples analyzed from April 1993 through October 1994. These analyses were all performed with a detection limit of 0.005 mg/L. During 1993, lead was not detected in any of the K-200 series monitoring wells, with the exception of K-202 whose analyses reported a concentration of 0.031 mg/L in October 1993. Lead was not detected in any of the K-200-series wells samples during the March, May, and July 1994 sampling events (see Appendix N-4 for analytical results). However prior to 1994, groundwater samples from the Sprayfield monitoring wells were submitted for total (unfiltered) inorganic analyses. At the request of DEP, beginning in 1994, quarterly groundwater samples from the Sprayfield were submitted for dissolved (filtered) inorganic analyses at a detection limit below the MCLs. The DEP request was consistent with West Virginia groundwater standards which compared dissolved constituents to MCLs. All results of the 1994 analyses for lead were below the MCL. Graphs of total lead concentrations in Sprayfield monitoring wells and influent are shown in Figures 11-2, 11-3, and 11-4.

Organic Concentrations

In October 1990, analyses for the Priority Pollutant List volatile and semivolatile organic compounds were performed on groundwater samples from the following wells: K-201, K-202, K-203, K-205, K-206, K-209, and LF-2 (Geraghty & Miller, *Sprayfield Treatment*). The only volatile organic compound detected in these groundwater samples was methylene chloride, which was detected in the trip blank at approximately the same concentration as in the well samples, indicating that the methylene chloride was introduced during the sampling or analytical process. No semivolatile compounds were detected (see Appendix N-4 and Table 17-4 for analytical results).

During an April 1992 Compliance Monitoring Inspection with DNR, groundwater samples from the nine K-200-series wells were analyzed for Priority Pollutant List volatile organics and semivolatile organic compounds (Geraghty & Miller, *Sprayfield Treatment*). Carbon tetrachloride was detected in K-209, and trichloroethene was detected in K-205 (see Appendix N-4 for analytical results).

Volatile organic analyses for Priority Pollutant List parameters were performed on the samples from the K-200-series (shallow) wells four times in 1994: March 29, May 17, July 11, and October 28. Volatile organics in all samples were reported as not detected in the March, May, and October sampling events. 1,1,1-Trichloroethane was detected in the K-202 sample in July, but no other volatile organics were detected in any other groundwater samples during this sampling event (see Appendix N-4 for analytical results).

23.4.2 Assessment of Further Groundwater Investigation Needs

For the RFI, groundwater in the vicinity of the Sprayfield was sampled from the existing monitoring wells and analyzed using SW-846 methodologies. It should be noted that the October 1994 analyses were performed using the SW-846 methods for all permit parameters, but for organic components, the Priority Pollutant List parameters were reported instead of the SW-846 list. The results of the sampling will be used in conjunction with additional data collected pursuant to the ongoing permit monitoring program to satisfy the monitoring and reporting requirements of the WPC Permit for the Sprayfield. The details of the groundwater sampling in the area of the Sprayfield will be provided in the RFI Report.

23.5 OUTFALL 001 CONVEYANCE AND AREA NORTH OF THE CONVEYANCE

The issues relative to discharges into Outfall 001 Conveyance are discussed in Section 22.0. Sediment samples collected from the Outfall 001 Conveyance have indicated possible impacts from past activities. No groundwater monitoring wells are currently located to the north of Outfall 001 Conveyance. Additional soil samples were collected from the Outfall 001 Conveyance as part of the RFI. The results of analyses were used to evaluate the need for groundwater monitoring wells in this area. The details of the soil sampling from the Outfall 001 Conveyance will be provided in the RFI Report.

23.6 AREA SURROUNDING OLD LANDFILL

A description of the Old Landfill at the facility is presented in Section 22.0 of this report. No groundwater wells had previously been installed immediately downgradient of the Old Landfill and, therefore, no prior assessment has been made of the groundwater quality downgradient of the Old Landfill. Because no groundwater quality data existed, two new wells were installed to assess the groundwater quality in the area downgradient of the Old Landfill. Upgradient groundwater quality can be ascertained by existing monitoring wells MW-1, MW-2, and LF-3. The details of the groundwater sampling conducted in the area of the Old Landfill will be provided in the RFI Report.

TABLE 23-1
SUMMARY OF TOTAL CYANIDE CONCENTRATIONS IN WELLS R-1 THROUGH R-3, AND F-3 FOR 1969 TO 1971

RCRA Consent Order - Description of Current Conditions
Ravenswood Aluminum Corporation
Ravenswood, West Virginia

WELL	AVERAGE TOTAL CYANIDE CONCENTRATION (mg/L)	TOTAL CYANIDE CONCENTRATION RANGE (mg/L)
R-1	1.85	0.93 - 4.24
R-2	0.45	0.16 - 1.01
R-3	0.18	0.06 - 0.22
F-3	0.67	0.36 - 1.55

TABLE 23-2
DATA FROM KAISER'S RFI - SPENT POTLINER PILE

	SPL-1 (DOWNGRADIENT)			SPL-2 (DOWNGRADIENT)			SPL-3 (UPGRADIENT)		
PARAMETER	MAY-96	AUG-96	SEP-96	MAY-96	AUG-96	SEP-96	MAY-96	AUG-96	SEP-96
Total Cyanide									
Unfiltered	5.3	6.3	11	4	3.4	3.9	7.9	6.2	9.5
Filtered	NA	NA	15	NA	NA	4.3	NA	NA	6.3
Weak Acid Dissociable Cyanide									
Unfiltered	0.14	0.3	0.2	0.11	0.14	0.17	0.09	0.29	0.21
Filtered	NA	NA	0.25	NA	NA	0.13	NA	NA	0.24
Free Cyanide by Microdiffusion									
Unfiltered	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Filtered	NA	NA	<0.020	NA	NA	<0.020	NA	NA	<0.020
Fluoride									
Unfiltered	2.9	4.8	5.5	3.3	3.7	3.9	3.8	4.4	4.1
Filtered	NA	NA	4.7	NA	NA	4.0	NA	NA	4.8
Chloride	21	39	NA	46	45	NA	53	72	NA
Sodium	200	280	NA	100	120	NA	67	69	NA
Total Dissolved Solids	1,300	1,200	1,900	860	8220	930	940	720	580

NA - Not Analyzed
all units mg/L
data from RFI Report, Spent Potliner Pile, CEC, October 1996

TABLE 23-3
TOTAL CYANIDE CONCENTRATIONS
IN BLOCKING WELLS - 1970s TO 1983

RCRA Consent Order - Description of Current Conditions
Ravenswood Aluminum Corporation
Ravenswood, West Virginia

WELL	APPROXIMATE AVERAGE TOTAL CYANIDE CONCENTRATION (mg/L)	APPROXIMATE RANGE TOTAL CYANIDE CONCENTRATION (mg/L)
R-1	1	0.003 - 7
R-2	0.5	0.01 - 2
R-3	1	0.007 - 20
R-4	0.07	0.003 - 10
R-7	0.005	0.001 - 0.007
F-1	0.1	0.002 - 2
F-2	0.005	0.001 - 0.2
F-3	7	0.01 - 40
F-4	0.007	0.001 - 0.2
F-5	0.007	0.001 - 0.2
F-7	0.005	0.001 - 0.01

TABLE 23-4
SUMMARY OF METALS IN DM-1 AND DM-4
APRIL 1987

ANALYTE (a)	MCL	D&M-1	D&M-4	TRIP BLANK	FIELD BLANK	CRDL
Aluminum	0.05-0.2 (f)	ND	ND	ND	ND	0.2
Arsenic	0.05	ND	ND	ND	ND	0.01
Barium	2	86 (b)	57 (b)	ND	8.0 (b)	0.2
Chromium	0.1	1.1 (b)	3.9	2.6 (b)	2.9 (b)	0.01
Copper	1.3	ND	ND	ND	ND	0.025
Iron	0.03 (f)	3880 (e)	323 (e)	110 (e)	84 (e)	0.1
Lead	0.015	ND	ND	ND	ND	0.003
Magnesium	—	13800	12200	ND	19 (b)	5
Manganese	0.05 (f)	8.0 (b)	7.0 (b)	ND	40 (b)	0.015
Nickel	0.1	22 (b)	20 (b)	ND	15 (b)	0.04
Selenium	0.05	11 (b, c)	2.4 (b, c)	1.6 (b, c)	1.6 (b, c)	0.005
Tin	—	ND	ND	ND	ND	—
Zinc	0.05 (f)	16 (b, d)	ND	6.0 (d)	6.0 (b, d)	0.02

(a) Analytical results are reported in parts per million unless otherwise noted.
(b) Value is greater than instrument detection limit but less than Contract Required Detection Limit under CLP.
(c) Not detected significantly above the level reported in laboratory field blanks.
(d) Estimated concentration; reported value may be biased low.
(e) Estimated concentration.
(f) Secondary Maximum Contaminant Level.
CRDL US EPA CLP Contract Required Detection Limit taken from 7/88 SOW.
MCL Maximum Contaminant Level.
ND Not detected.

TABLE 23-5
BLOCKING WELL CONSTRUCTION SUMMARY

BLOCKING WELL DESIGNATION	DATE INSTALLED	DEPTH (feet below land surface)	SCREEN INTERVAL (feet below land surface)	WELL DIAMETER (inches)
R-1	April 1965	108	Unknown	12
R-2	March 1957	105	90 - 105	12
R-3	Unknown	115	100 - 115	12
R-4	September 1966	116	100 - 116	12
F-1	February 1965	109	94 - 109	12
F-3 (inactive)	1963	114	99 - 114	
F-10	April 1990	115	95 - 115	12

TABLE 23-6
ESTIMATED CONCENTRATIONS OF CYANIDE IN THE UNSATURATED ZONE[a]

AREA	ESTIMATED QUANTITY OF LEACHABLE TOTAL CYANIDE
Cathode Waste Storage Pile (Kaiser's Potliner Pile)	22 - 115 tons
Northwest Pot Dump	8 - 12 tons
Bottomlands East of RT 5	2.5 - 4 tons
Old Pot Lining Loadout	0.5 tons
Site of surface runoff impoundment (Drainage Pathway from Potliner Pile)	0.5 - 1 tons
Total (approximate)	33.5 - 132.5 tons

a from Dames & Moore, *Comprehensive*

TABLE 23-7
ESTIMATED TOTAL CYANIDE REMOVAL BY BLOCKING WELLS - 1982 THROUGH 1996

BLOCKING WELL DESIGNATION	TOTAL CYANIDE REMOVED (tons)
R-1	0.17
R-2	0.31
R-3	40.75
R-4	7.55
F-1	0.19
F-3/F-10	6.23
1982 - 1996 Total	55.20

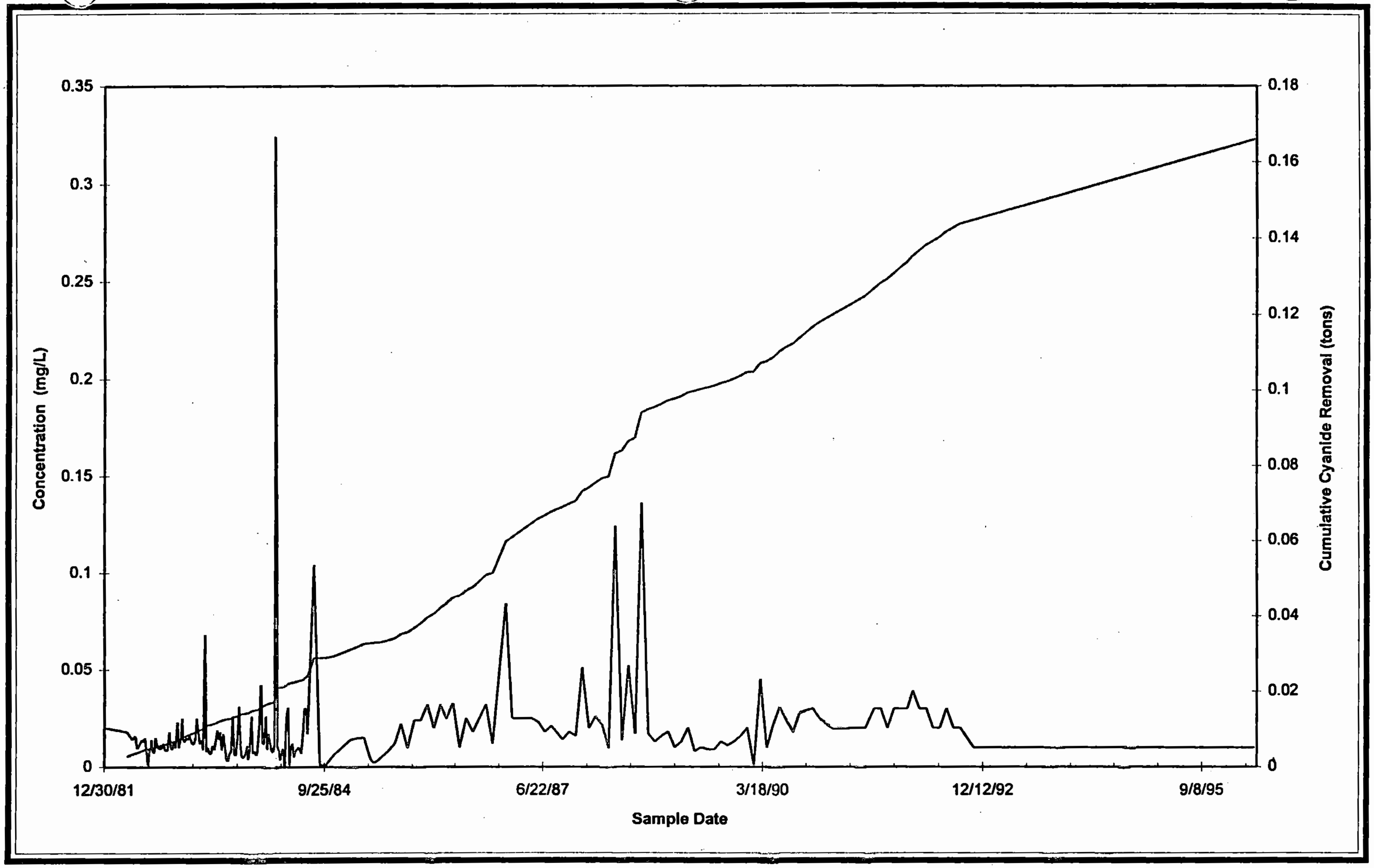


Figure 23-1a
Cyanide Removal from Blocking Well R-1

RMT INC

70410.24

Ravenswood Aluminum Corporation

Ravenswood, VA

g:\data\hydro\70410\excel\bwcnrem.xls

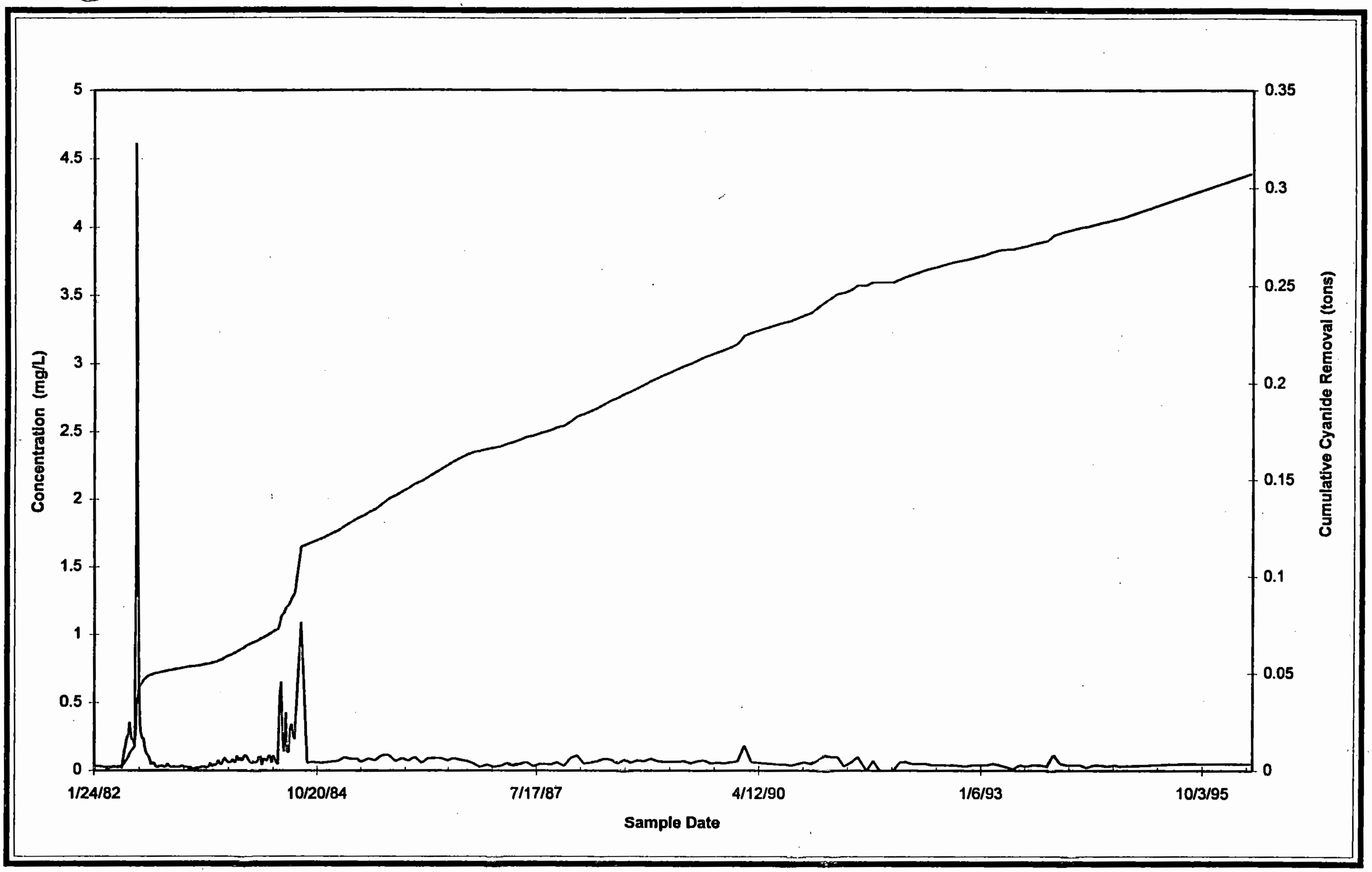


Figure 23-1b
Cyanide Removal from Blocking Well R-2

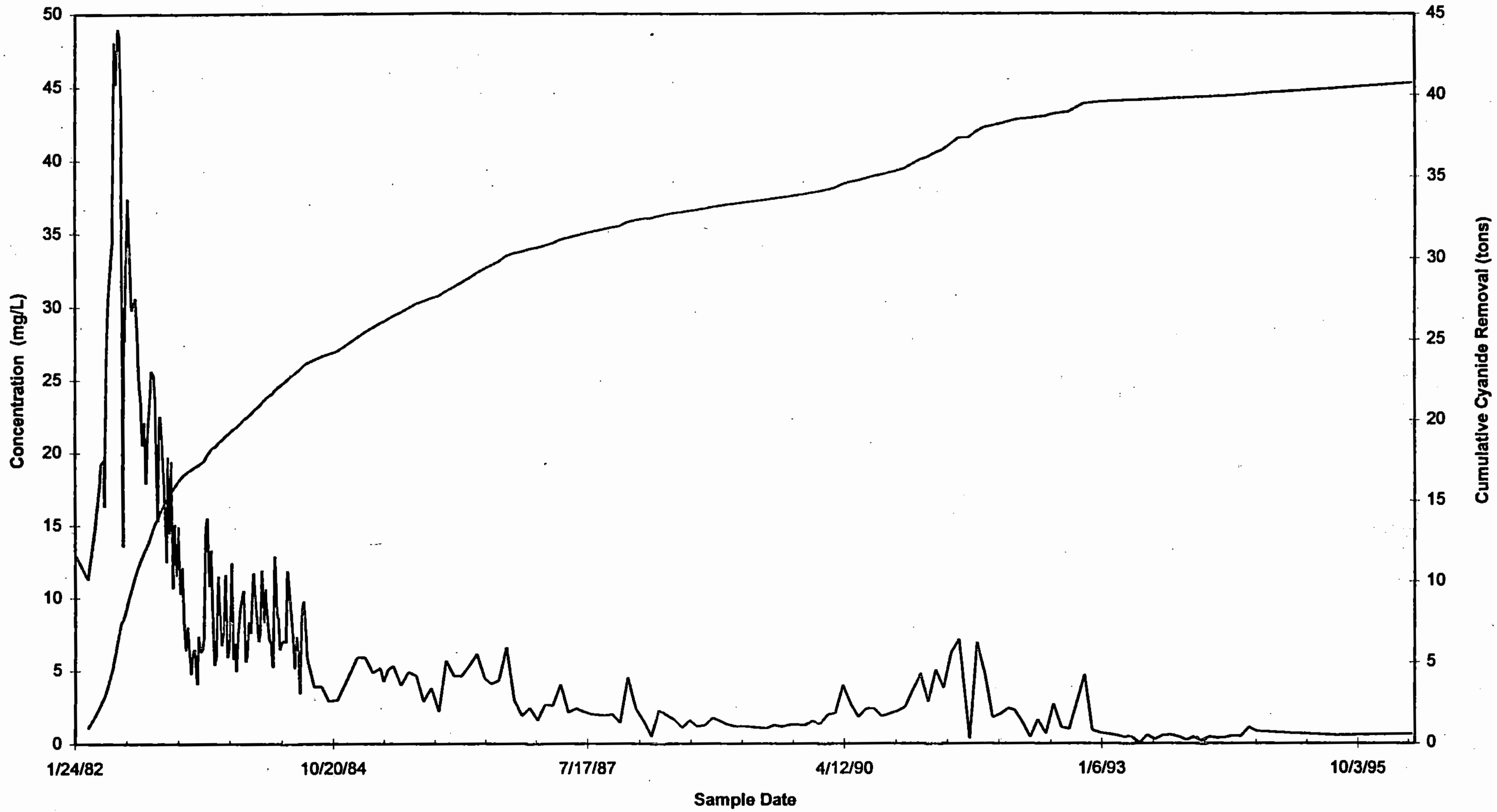
RMT INC

70410.24

Ravenswood Aluminum Corporation

Ravenswood, VA

g:\data\hydro\70410\excel\bwcnrem.xls



RMT INC

Figure 23-1c
Cyanide Removal from Blocking Well R-3

70410.24

Ravenswood Aluminum Corporation

Ravenswood, VA

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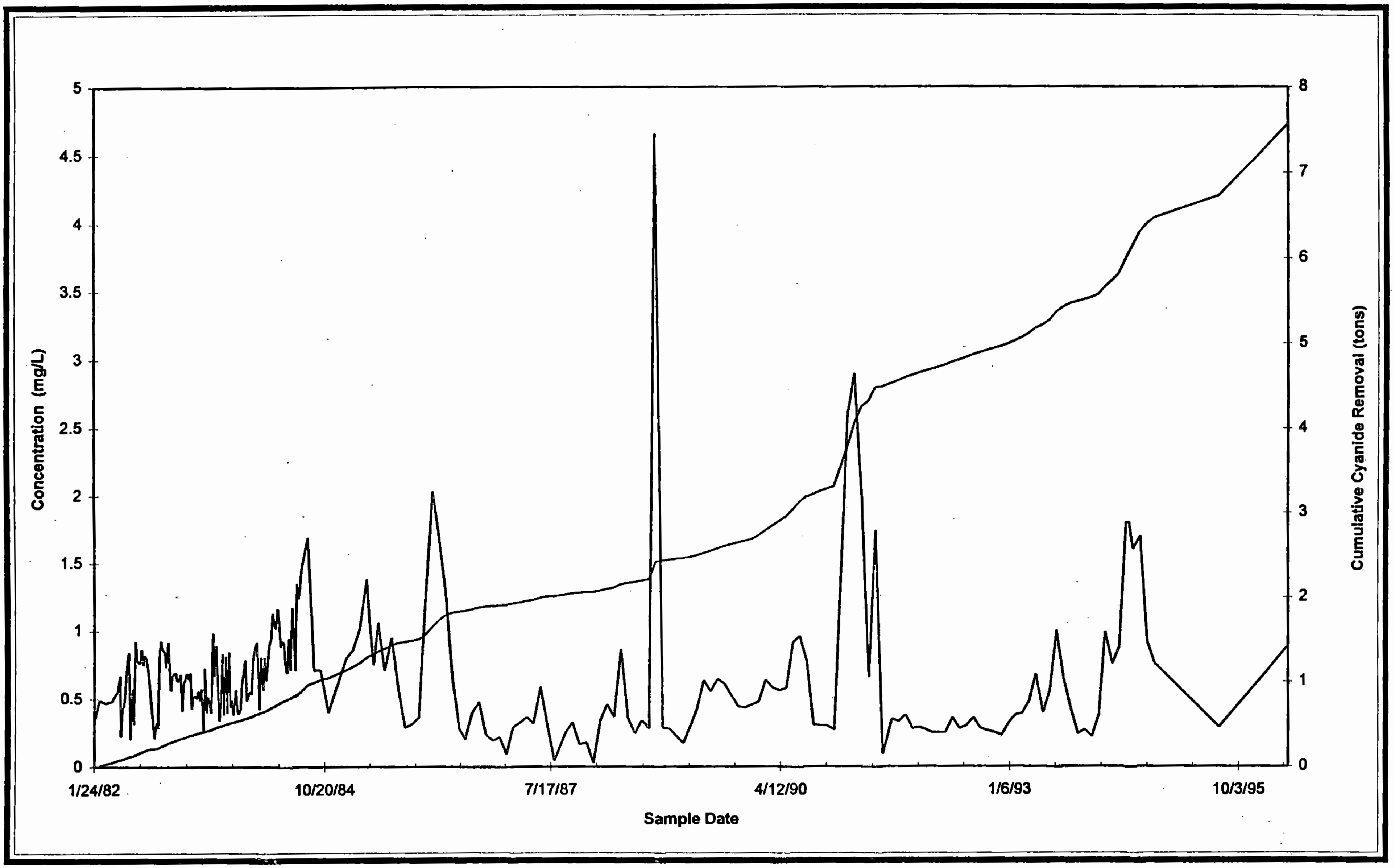

Figure 23-1d
Cyanide Removal from Blocking Well R-4

RMT INC

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70410.24
Ravenswood Aluminum Corporation
Ravenswood, VA

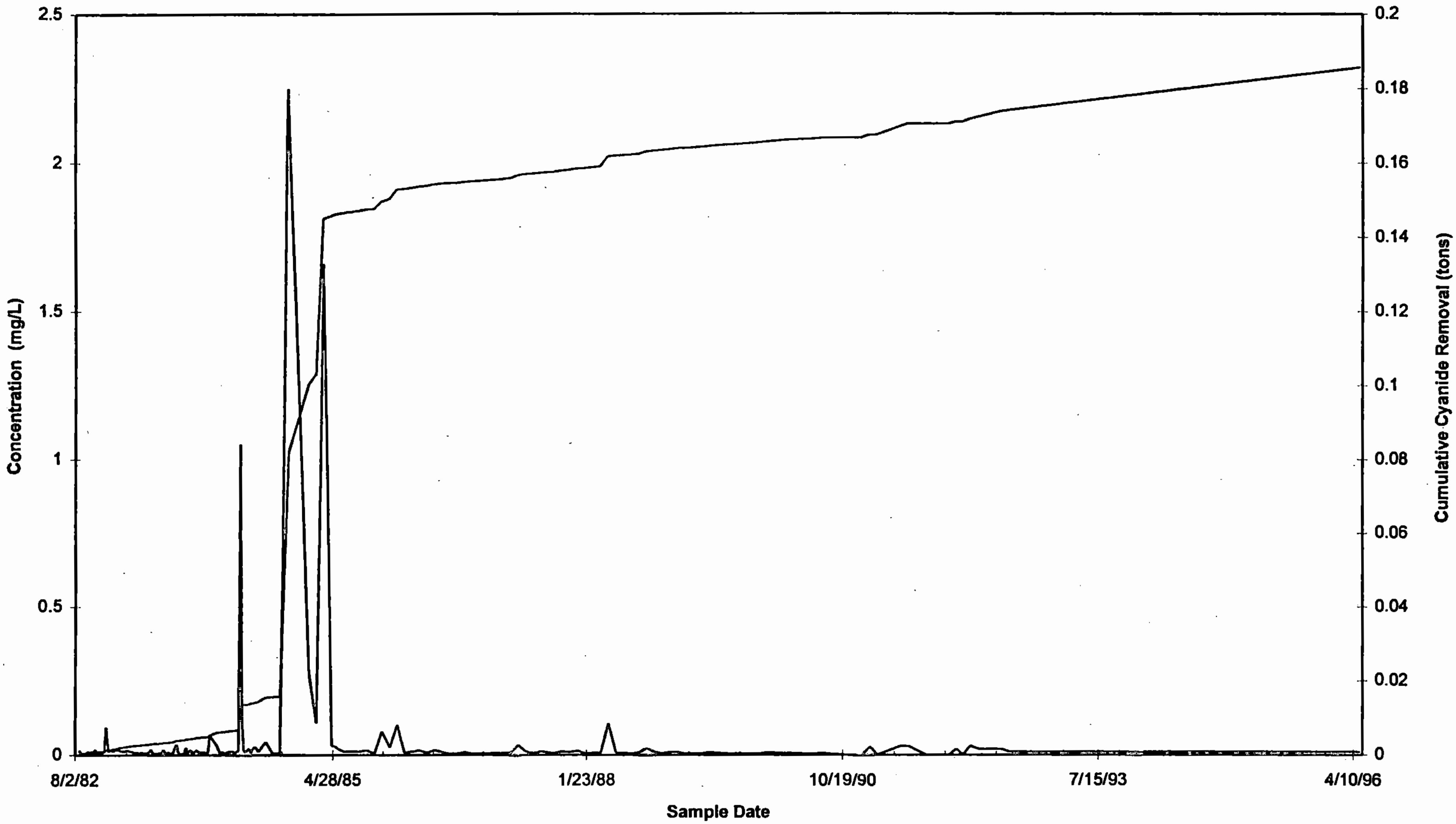

Figure 23-1e
Cyanide Removal from Blocking Well F-1

70410.24

Ravenswood Aluminum Corporation

Ravenswood, VA

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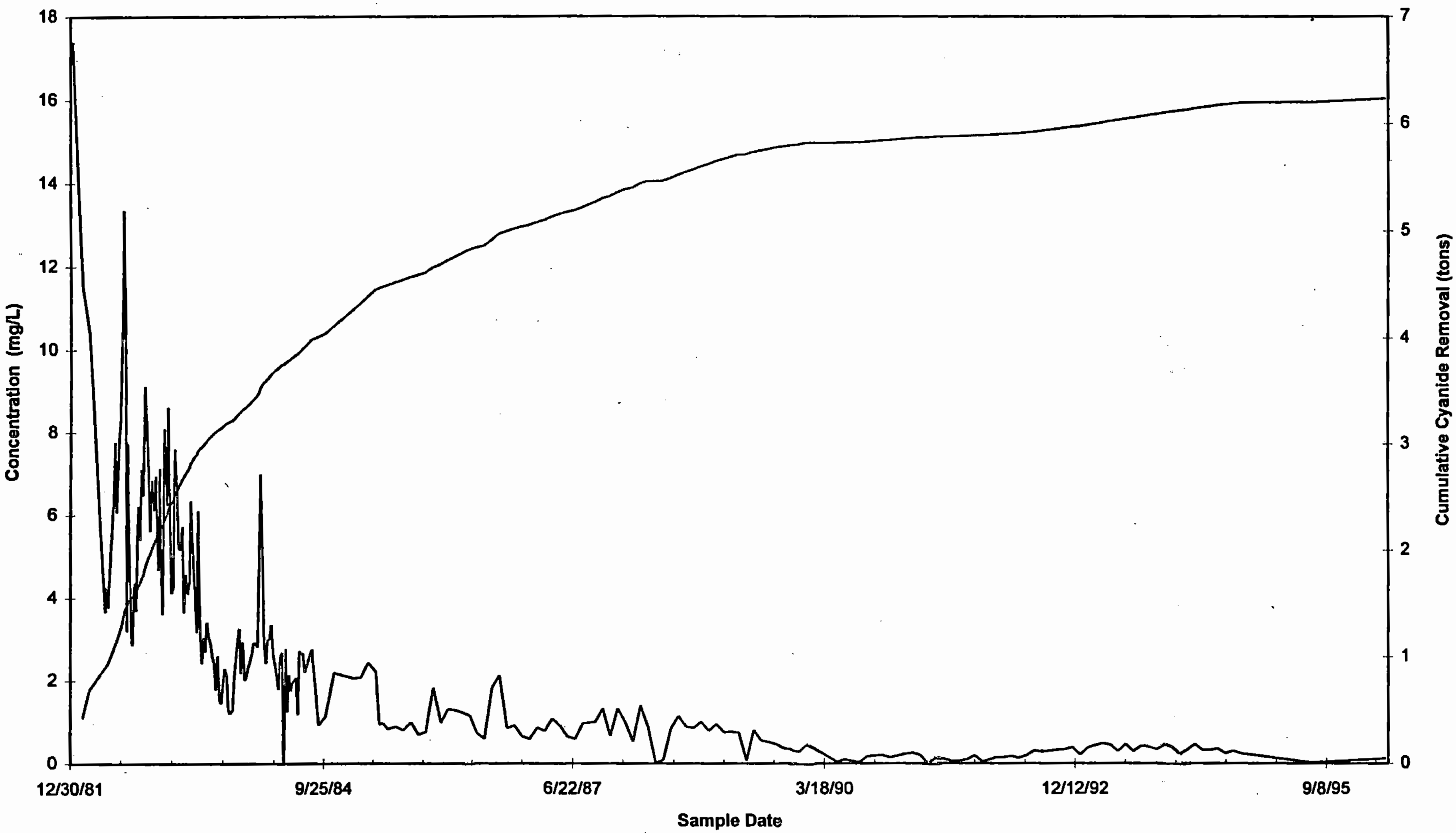

RMT INC

Figure 23-1f
Cyanide Removal from Blocking Well F-3/F-10

70410.24

Ravenswood Aluminum Corporation

Ravenswood, VA

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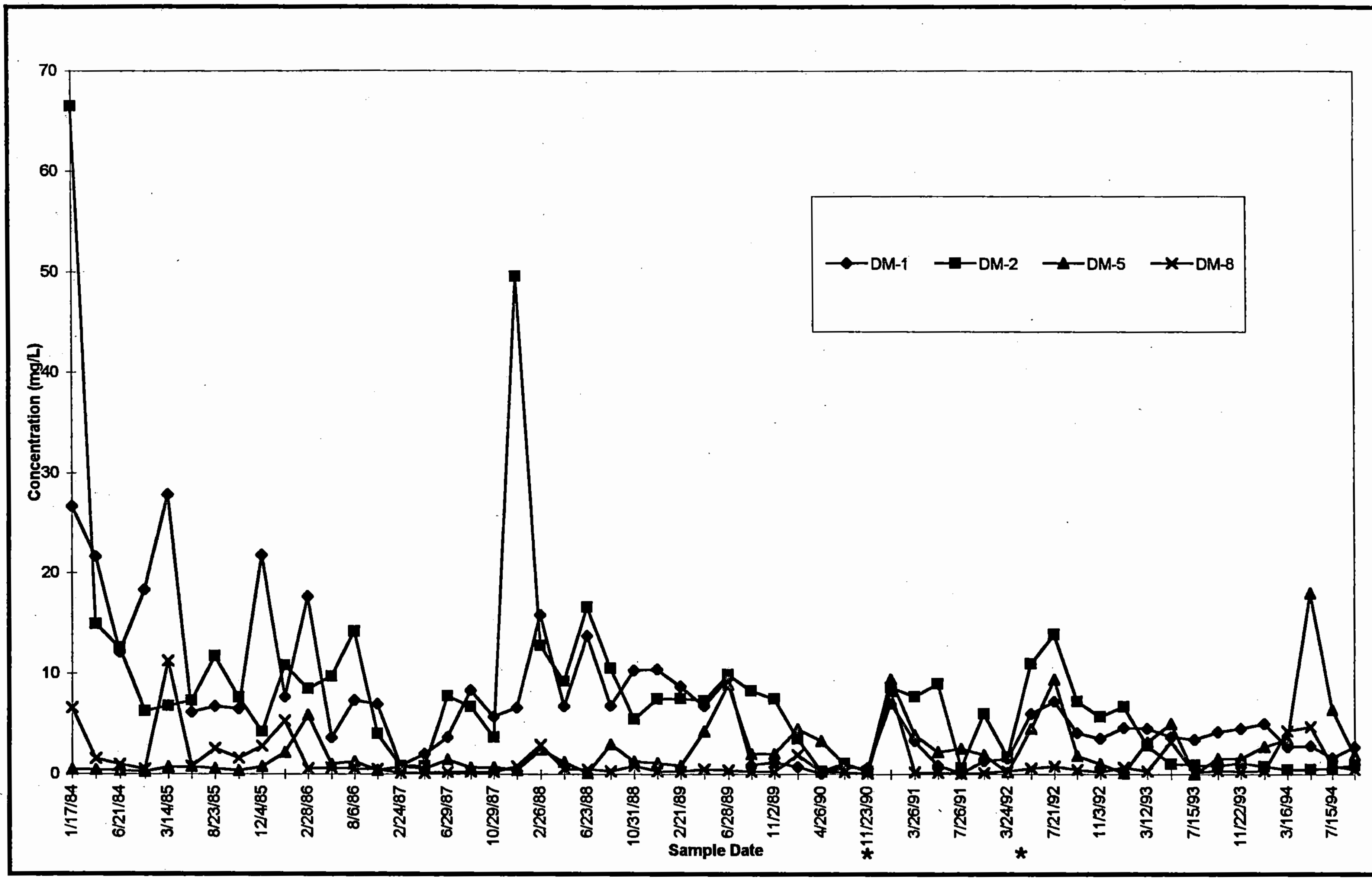


* Different analytical lab was used from 11/90 to 4/92

Figure 23-2a
Total Cyanide Concentration in DM Series Wells

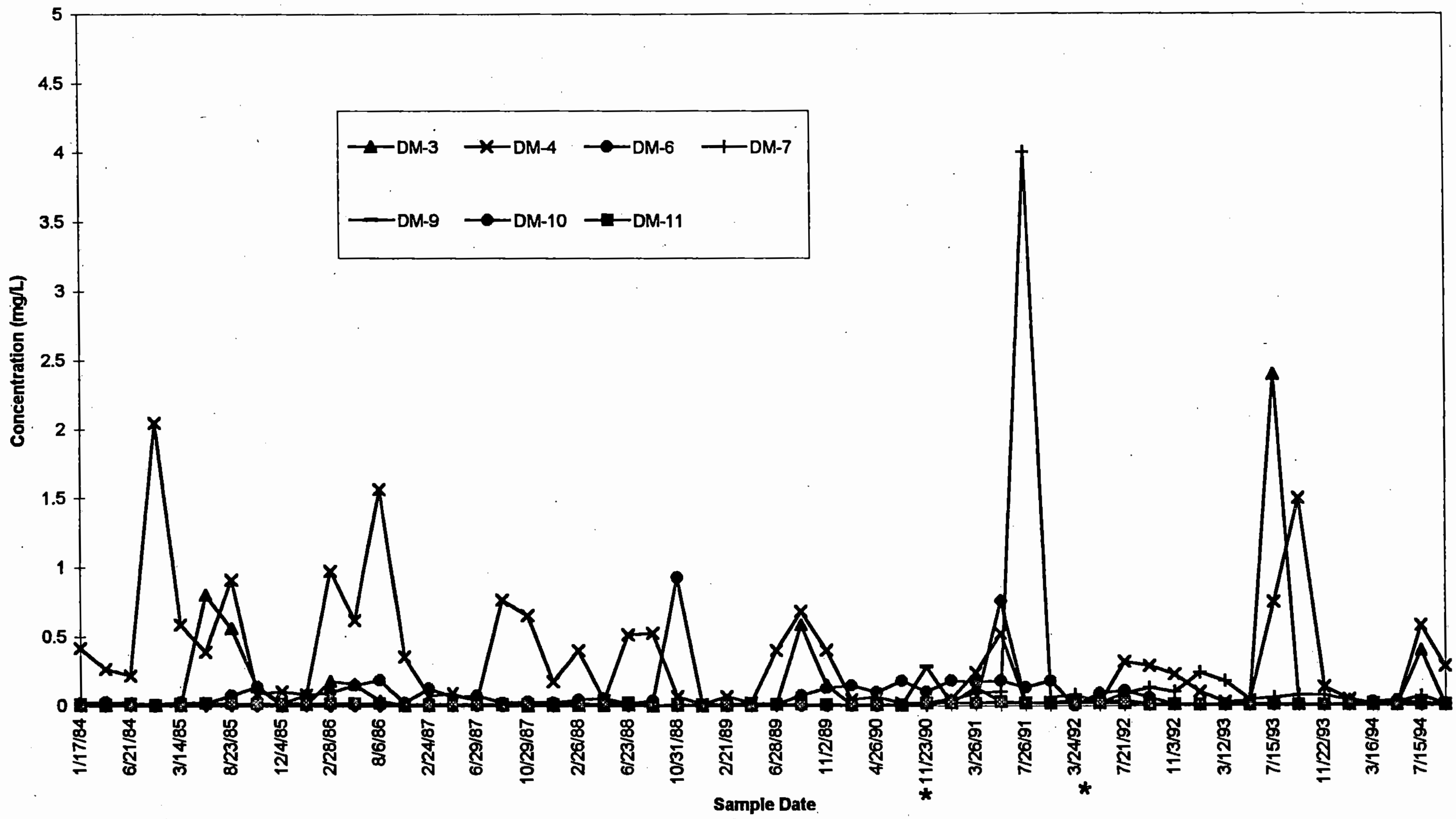
RMT INC

70410.21

Ravenswood Aluminum Corporation

Ravenswood, WV

g:\data\hydro\70410\graphs\dcc.xls



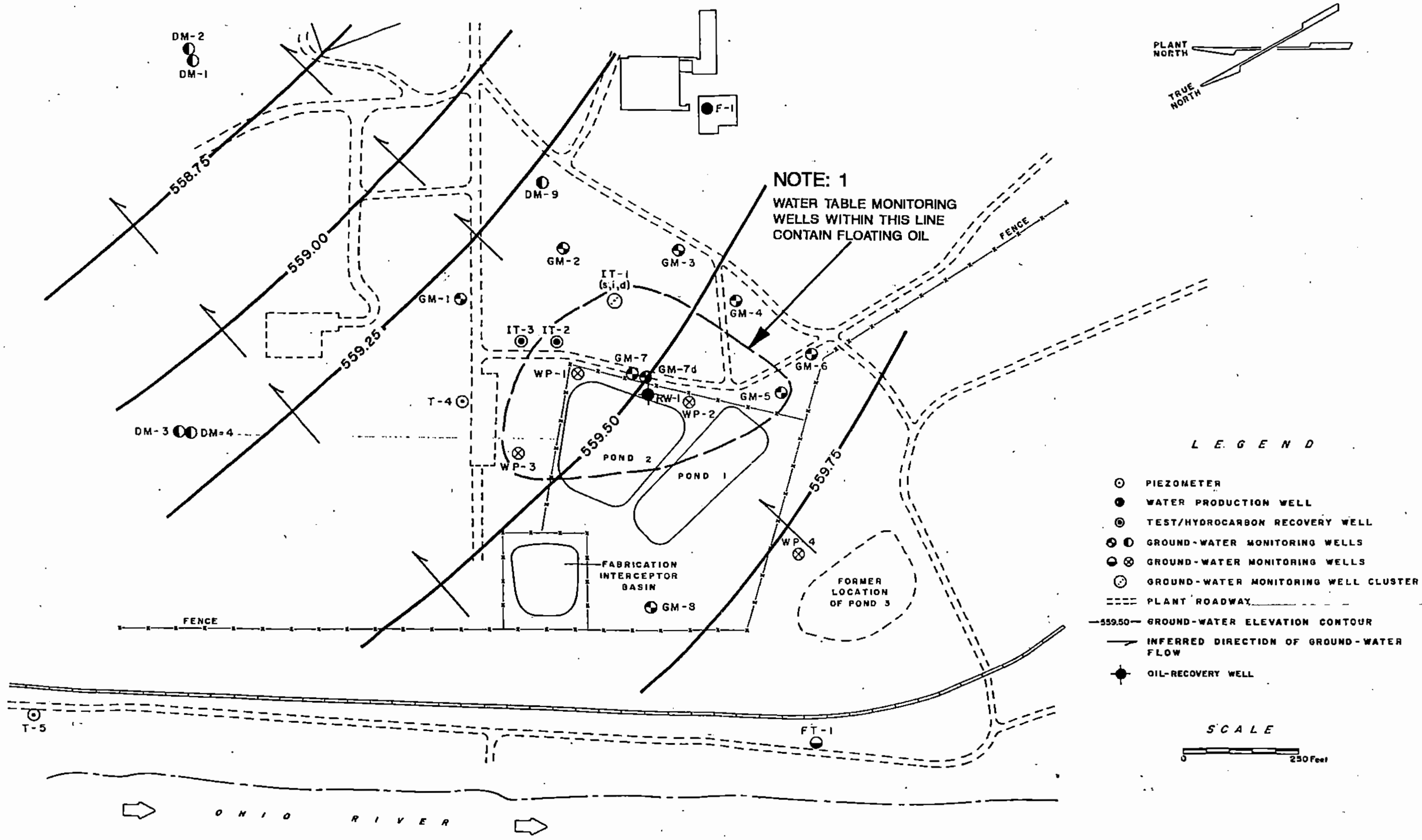
* Different analytical lab was used from 11/90 to 4/92

Figure 23-2b
Total Cyanide Concentration in DM Series Wells

RMT INC

g:\data\hydro\70410\graphs\dcc.xls

70410.21
Ravenswood Aluminum Corporation
Ravenswood, WV



NOTE:
THIS MAP WAS FURNISHED TO RMT, INC. BY THE CLIENT. AND WAS PREPARED BY GERAGHTY & MILLER, INC. DATED 9/14/89

RMT ADDED NOTE 1. DATED MARCH 1, 1996.

RMT INC. 70410.21
0296

FIGURE 23-3
GROUND WATER FLOW IN THE VICINITY OF THE OIL RECOVERY PONDS
RAVENSWOOD ALUMINUM
RAVENSWOOD, WV
SCALE NOTED

24.0 SUMMARY

The RAC facility is a fully integrated aluminum facility composed of a Reduction Plant and a Fabrication Plant (sheet, plate, and coil mill). Prior to February 7, 1989, KACC owned and operated the facility. Currently, RAC owns and operates the facility, with the exception of the Potliner Pile and Potliner Vault which continue to be owned and maintained by KACC. The facility is located on a 2,600 acre-site within Ravenswood Bottom, an alluvial deposit situated along the Ohio River Valley. The industrial area of the facility consists of approximately 300 acres of the 2,600-acre total land area owned by RAC, resulting in a buffer zone around the facility.

24.1 SUMMARY OF SITE GEOLOGY AND HYDROGEOLOGY

The soil beneath the site consists of downward coarsening sequence of silts and clayey silts and sand and gravel outwash deposits. These unconsolidated deposits range in thickness from approximately 80 to 100 feet and are underlain by sedimentary bedrock. The uppermost aquifer unit beneath the facility is the alluvial aquifer, which ranges in depth from 40 to 70 feet below ground surface. The alluvial aquifer is capable of sustaining a million-gallon-per-day-pumpage.

The natural (non-pumping condition) flow of groundwater would be towards the Ohio River. However, due to the pumpage of the blocking wells and production wells F-8 and F-9, the flow is towards the blocking wells in most of the industrial portions of the facility and towards the production wells at the southern edge of the Sprayfield and Industrial Landfill areas. The groundwater flow velocities were estimated to be about 1900 ft/yr in the deepest, most transmissive portions of the aquifer, just above bedrock.

24.2 SUMMARY OF FACILITY AREAS AND GROUNDWATER QUALITY AREAS

The areas of the facility listed as SWMUs in the 1988 Versar (US EPA Contractor) RFA Report and other areas discussed in this DCC Report include the following:

- Potliner Pile,
- Potliner Breakout and Accumulation Building,
- Rotary Barrel Baghouse Catch Landfill,
- Tank 1 and Emergency Spill Basin,

- Oil Recovery Ponds,
- Tank Farm,
- Sprayfield,
- Boiler House Day Tank,
- Elephant Shed,
- Siphon Aspirator Cleaning Station,
- Horizontal Heat Quench System,
- Neutralization Tank,
- Industrial Landfill,
- Gravel Dross Landfill,
- Sump at Pond 3,
- Bath Storage Pile,
- Cooling Tower Sludge Bins,
- Areas of Former Potliner Management and associated runoff areas,
- Old Landfill,
- Outfall 001 Conveyance,
- Railcar Loadout Building,
- Used Oil Sumps and Piping, and
- Storm Water and Wastewater System.

The operation and construction of these units and the need for further soil sampling associated with these units are summarized in Table 24-1.

Plate 6 shows where groundwater has been monitored at the facility. For the purpose of groundwater assessment in the RFI, the facility was divided into six areas:

- The Areas of Former Potliner Management,
- The Oil Recovery Pond Area,
- The Industrial Landfill,
- The Old Landfill,
- The Sprayfield, and
- The Outfall 001 Conveyance.

The groundwater quality and the need for further groundwater sampling for these areas are summarized in Table 24-2.

The details of the soil and groundwater investigations conducted for the RFI are discussed in the Data Collection Quality Assurance Plan of the approved RFI Workplan.

TABLE 24-1
SUMMARY OF AREAS DISCUSSED IN DCC REPORT AND PROPOSED SOIL SAMPLING
Ravenswood Aluminum Corporation

UNIT OR AREA	SWMU NO. (1)	DATES OF OPERATION OR USE	BRIEF DESCRIPTION OF OPERATION OR USE	POSSIBLE HAZARDOUS CONSTITUENTS	RESULTS OF PRIOR SOIL SAMPLING	FURTHER SOIL SAMPLING PROPOSED
Old Northwest Pot Dump	—	1959 to 1963	Broken out potliner from monolithic pots was placed in the Old Northwest Pot Dump.	Cyanide	Presence of cyanide in soils	Yes
Runoff from Northwest Pot Dump and Bottomlands	—	—	Runoff from the Old Northwest Pot Dump followed a path to a low area near the river.	Cyanide	Presence of cyanide in soils	Yes
Pot Soaking Piers	—	1963 to 1970	Pots were soaked while elevated on the Pot Soaking Piers prior to breakout.	Cyanide	Presence of cyanide in soils	Yes
Potliner Loadout Area	—	1963 to 1970	Broken out potliner was staged in the Potliner Loadout Area prior to loading on barges.	Cyanide	Presence of cyanide in soils	Yes
Pot Soaking Pits and Elephant Shed	—	1970 to 1979	Pots were soaked in the Pot Soaking Pits prior to breakout on an adjacent concrete pad. Broken out potliner was accumulated in the Elephant Shed prior to shipment off-site or placement on the Potliner Pile.	Cyanide	Presence of cyanide in soils	Yes
Potliner Pile (3)	1	1972 to 1980	Broken out potliner was placed in this pile. The initial pile had a concrete base with 18 inch sidewalls, but no cover. Pile was covered first with bentonite and then with gunite, and now with an impermeable synthetic cover.	Cyanide	Presence of cyanide in soils	Yes

Notes:
1. As listed in the 1988 Versar RFA Report.
2. The Anode Burnoff Piles have been present at several times during the operation of the plant, but is rarely present now due to improvements in the reduction process.
3. Property still owned and maintained by KACC.
4. These buildings are also called Buildings 65 and 66 and are currently being used.

TABLE 24-1
SUMMARY OF AREAS DISCUSSED IN DCC REPORT AND PROPOSED SOIL SAMPLING
Ravenswood Aluminum Corporation

UNIT OR AREA	SWMU NO. (1)	DATES OF OPERATION OR USE	BRIEF DESCRIPTION OF OPERATION OR USE	POSSIBLE HAZARDOUS CONSTITUENTS	RESULTS OF PRIOR SOIL SAMPLING	FURTHER SOIL SAMPLING PROPOSED
Drainage Path for Runoff from Several Former Potliner Management Areas	—	—	Runoff from the Potliner Pile and Elephant Shed and the former locations of the Pot Soaking Pits and Pot Soaking Piers flowed in a Path westward towards the river. The runoff was temporarily ponded up in a basin which existed from 1976 to 1979.	Cyanide	Presence of cyanide in soils	Yes
Outfall 003	—	—	Part of the runoff from the Potliner Pile and Elephant Shed and the former locations of the Pot Soaking Pits and Pot Soaking Piers was discharged through this outfall. Overflow from the Pot Soaking Piers also flowed to this outfall through sewers.	Cyanide	Not Applicable	Yes
Potliner Breakout and Accumulation Buildings (4)	2	1979 to Present	Pots are broken out and accumulated here in tubs for less than 90 days.	Cyanide	Negligible amount of cyanide in soils	Yes
Anode Burnoff Pile	—	(2)	The Anode Burnoff Pile in question was present prior to 1980.	PAHs	No substantial hazardous constituents in soils	Yes
Rotary Barrel Baghouse Catch Landfill	3	—	This landfill was never constructed.	None	Not Applicable	No
Tank 1 and Emergency Spill Basin	4	Prior to 1971 to present	Waste coolant is held in this tank prior to tranport to the Oil Recovery Ponds.	Lead, Hydrocarbons, Cycloalkanes, Organics	No substantial hazardous constituents in soils	Yes

Notes:
1. As listed in the 1988 Versar RFA Report.
2. The Anode Burnoff Piles have been present at several times during the operation of the plant, but is rarely present now due to improvements in the reduction process.
3. Property still owned and maintained by KACC.
4. These buildings are also called Buildings 65 and 66 and are currently being used.

TABLE 24-1
SUMMARY OF AREAS DISCUSSED IN DCC REPORT AND PROPOSED SOIL SAMPLING
Ravenswood Aluminum Corporation

UNIT OR AREA	SWMU NO. (1)	DATES OF OPERATION OR USE	BRIEF DESCRIPTION OF OPERATION OR USE	POSSIBLE HAZARDOUS CONSTITUENTS	RESULTS OF PRIOR SOIL SAMPLING	FURTHER SOIL SAMPLING PROPOSED
Oil Recovery Pond 1	5	1971 to Present	Waste coolant is transported to Ponds 1 and 2 for gravity separation. In the past, the oil phase from Ponds 1 and 2 was placed in Pond 3. The recovered oil is placed in the Tank Farm.	Lead, Hydrocarbons, Cycloalkanes, Organics	No substantial hazardous constituents in soils	Yes
Oil Recovery Pond 2	5	1971 to Present				
Oil Recovery Pond 3	5	1972 to 1988				
Tank Farm	6	1973 to Present	Recovered oil from the Oil Recovery Ponds is stored in these tanks before being pumped to the Boiler House Day Tank.	Lead, Hydrocarbons, Cycloalkanes, Organics	Not Applicable	Yes
Sprayfield	7	1972 to Present	The water phase from the Oil Recovery Ponds is applied to the Sprayfield.	Lead, Hydrocarbons, Cycloalkanes, Organics	No substantial presence of volatile organics Possible presence of lead and semivolatile organics	Yes
Boiler House Day Tank	8	1957 to Present	The Boiler House Tank holds a days supply of oil from the Oil Recovery Ponds or from an oil distributor prior to use as fuel in one of the plant's boilers.	Lead, Hydrocarbons, Cycloalkanes, Organics	No substantial hazardous constituents in soils	No

Notes:
1. As listed in the 1988 Versar RFA Report.
2. The Anode Burnoff Piles have been present at several times during the operation of the plant, but is rarely present now due to improvements in the reduction process.
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4. These buildings are also called Buildings 65 and 66 and are currently being used.

TABLE 24-1
SUMMARY OF AREAS DISCUSSED IN DCC REPORT AND PROPOSED SOIL SAMPLING
Ravenswood Aluminum Corporation

UNIT OR AREA	SWMU NO. (1)	DATES OF OPERATION OR USE	BRIEF DESCRIPTION OF OPERATION OR USE	POSSIBLE HAZARDOUS CONSTITUENTS	RESULTS OF PRIOR SOIL SAMPLING	FURTHER SOIL SAMPLING PROPOSED
Elephant Shed	9	1970 to Present	The Elephant Shed was originially used to manage broken out potliner prior to placement on the Potliner Pile. From 1979 to 1987, the Elephant Shed was sometimes used for staging drummed material. Currently, rubble, concrete, and dirt are accumulated in this unit.	Cyanide, Organics	Possible hazardous constituents in soils in runoff area	Yes
Siphon Aspirator Cleaning Station	10	1957 to 1980	Siphon aspirators were cleaned in a tank with caustic solution. Spent caustic solution drained through a storm sewer and the 004 Interceptor Basin to the Ohio River in accordance with NPDES Permit limits.	None	Not Applicable	No
Horizontal Heat Quench System	11	1978 to Present	Plates are quenched in this system after metallurgical heat treatment.	None	Not Applicable	No
Neutralization Tank	12	1978 to Present	This tank is used to neutralize regeneration waste water from the demineralization resin beds.	Corrosivity	Not Applicable	Yes
Industrial Landfill	13	1960 to 1992	Industrial Landfill received wastes from the facility. The exact types of wastes placed in this unit prior to 1989 are not well documented.	Organics	Not Applicable	No
Gravel Dross Landfill	14	1978 to 1979	Pea gravel was used as a flux cover in the rotary barrel furnaces for a short time and was placed in this unit when spent.	None	No substantial hazardous constituents in soils	No

Notes:
1. As listed in the 1988 Versar RFA Report.
2. The Anode Burnoff Piles have been present at several times during the operation of the plant, but is rarely present now due to improvements in the reduction process.
3. Property still owned and maintained by KACC.
4. These buildings are also called Buildings 65 and 66 and are currently being used.

TABLE 24-1
SUMMARY OF AREAS DISCUSSED IN DCC REPORT AND PROPOSED SOIL SAMPLING
Ravenswood Aluminum Corporation

UNIT OR AREA	SWMU NO. (1)	DATES OF OPERATION OR USE	BRIEF DESCRIPTION OF OPERATION OR USE	POSSIBLE HAZARDOUS CONSTITUENTS	RESULTS OF PRIOR SOIL SAMPLING	FURTHER SOIL SAMPLING PROPOSED
Sump at Pond 3	15	1972 to 1988	The Sump at Pond 3 was orignially used to drain the influent line to the Sprayfield prior to freezing conditions. The Sump at Pond 3 was also connected to a drain in the Sprayfield pump house.	Lead, Hydrocarbons, Cycloalkanes, Organics	No substantial hazardous constituents in soils	No
Bath Storage Pile	16	1979 to Present	Pot pads and attached bath material are staged outside the Potliner Breakout and Accumulation Buildings. Bath can fall off of the pads during handling and form small piles.	None	No substantial hazardous constituents in soils	No
Cooling Tower Sludge Bins	17	1986	There was a one-time staging of cooling tower sludge in bins next to Tank 1 while KACC and the agency decided on a disposal method.	Organics	No substantial hazardous constituents in soils	No
Old Landfill	—	Prior to 1960	Specific types of waste materials placed in the Old Landfill are not well documented.	Unknown	Not Applicable	No
Railcar Loadout Building	—	1991 to 1993 and 1994	Broken out potliner was loaded into railcars in this enclosed building.	Cyanide	Not Applicable	Yes
Outfall 001 Conveyance	—	1957 to present	Prior to the construction of the Oil Recovery Ponds in 1971, water phase of waste coolant was discharged to the river through this conveyance.	Lead, Hydrocarbons, Cycloalkanes, Organics, PCBs	Not Applicable	Yes
Carbon Plant Used Oil System	---	1957 to present	Removes and accumulates used hydraulic oil from carbon plant.	Metals, Hydrocarbons	Not Applicable	No

Notes:
1. As listed in the 1988 Versar RFA Report.
2. The Anode Burnoff Piles have been present at several times during the operation of the plant, but is rarely present now due to improvements in the reduction process.
3. Property still owned and maintained by KACC.
4. These buildings are also called Buildings 65 and 66 and are currently being used.

TABLE 24-1
SUMMARY OF AREAS DISCUSSED IN DCC REPORT AND PROPOSED SOIL SAMPLING
Ravenswood Aluminum Corporation

UNIT OR AREA	SWMU NO. (1)	DATES OF OPERATION OR USE	BRIEF DESCRIPTION OF OPERATION OR USE	POSSIBLE HAZARDOUS CONSTITUENTS	RESULTS OF PRIOR SOIL SAMPLING	FURTHER SOIL SAMPLING PROPOSED
Fabrication Plant Used Oil System	---	1957 to present	Manages used coolant and hydraulic oil from Hotlines and Cold Mills.	Hydrocarbons	Not Applicable	No
Interceptor Basins	---	1974 to present	Manage wastewater and stormwater from facility.	Metals, Organics	Sediment non-hazardous.	**
Outfall 007	---	1957 to present	Drain stormwater from facility	Metals, Organics	Not Applicable	Yes
Solid Pitch Unloading - Stormwater Drainage Area	—	1957 to present	Drain stormwater from Solid Pitch Unloading Area	PAHs	Not Applicable	Yes
Storage Area North of Carbon Plant - Stormwater Drainage Area	—	1957 to present	Drain Stormwater from storage area north of Carbon Plan	Metals, Organics	Not Applicable	Yes

** Alternative methods of satisfying USEPA's concerns about the interceptor basins are being considered.

Notes:
1. As listed in the 1988 Versar RFA Report.
2. The Anode Burnoff Piles have been present at several times during the operation of the plant, but is rarely present now due to improvements in the reduction process.
3. Property still owned and maintained by KACC.
4. These buildings are also called Buildings 65 and 66 and are currently being used.

TABLE 24-2
SUMMARY OF GROUNDWATER AREAS AND PROPOSED GROUNDWATER SAMPLING
Ravenswood Aluminum Corporation

GROUNDWATER AREA	RESULTS OF PRIOR GROUNDWATER SAMPLING	FURTHER GROUNDWATER SAMPLING PROPOSED
Areas of Former Potliner Management	Decreasing concentrations of cyanide	No
Area Underlying Oil Recovery Ponds	No hazardous constituents in groundwater	(1)
Area Underlying the Industrial Landfill	Minimal detection of volatile organics	Yes
Area Underlying the Sprayfield	Low concentrations of volatile and semivolatile organics	Yes
Area Underlying Outfall 001 Conveyance	(2)	(3)
Area Underlying the Old Landfill	(2)	Yes

Notes:
1. Install well to assess presence of free-phase oil.
2. Data has not been collected for these areas.
3. Contingent upon the results of analyses of sediment samples from the Outfall 001 Conveyance.

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